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TRANSACTIONS

OF THE

NORFOLK & NORWICH

NATURALISTS' SOCIETY.

[VOLS. I. AND II. ARE EDITED BY T. SOUTHWELL, HON. SEC.]

The Norfolk and Norwich Naturalists' Society has for its objects:—

1. The Practical study of Natural Science.
2. The protection, by its influence with landowners and others, of indigenous species requiring protection, and the circulation of information which may dispel prejudices leading to their destruction.
3. The discouragement of the practice of destroying the rarer species of birds that occasionally visit the County, and of exterminating rare plants in their native localities.
4. The record of facts and traditions connected with the habits, distribution, and former abundance or otherwise of animals and plants which have become extinct in the County; and the use of all legitimate means to prevent the extermination of existing species, more especially those known to be diminishing in numbers.
5. The publication of Papers on Natural History, contributed to the Society, especially such as relate to the County of Norfolk.
6. The facilitating a friendly intercourse between local Naturalists, by means of Meetings for the reading and discussion of papers and for the exhibition of specimens, supplemented by Field-meetings and Excursions, with a view to extend the study of Natural Science on a sound and systematic basis

TRANSACTIONS

OF THE

NORFOLK AND NORWICH

NATURALISTS' SOCIETY.

VOL. II.

1874—75 TO 1878—79.

Norwich:
PRINTED BY FLETCHER AND SON.
1879.

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TRANSACTIONS

OF THE

Norfolk and Norwich

NATURALISTS' SOCIETY;

Presented to the Members for

1874–75.

VOL. II.—PART I.

Norwich:
PRINTED BY FLETCHER AND SON.
1875.

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1 for 1872—3	£0	5	0			
4 ,, 1873—4	1	0	0			
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W. H. BIDWELL, *Auditor.*

ADDRESS.

Read by the President, MR. H. D. GELDART, *to the Members of the Norfolk and Norwich Naturalists' Society, at their Sixth Annual Meeting, held at the Norfolk and Norwich Museum, March 30th, 1875.*

LADIES AND GENTLEMEN—

In resigning into your hands the office of President with which you entrusted me, I have much pleasure in congratulating you on the prosperous state of our Society. The number of our members steadily increases, although we have this year lost by death two of our original members, Mr. Bransby Francis and Mr. Thomas Hancock; in both cases their lives have been sadly and unexpectedly cut short. Our finances are in a good and sound condition; the extra expense which was incurred by printing Mr. C. G. Barrett's valuable list of *Lepidoptera* in a separate form, has been much lightened by the liberal contributions of Lord Walsingham and others, given specially for that object; and though the publication of the various lists of the *Fauna* and *Flora* of the county is a heavy charge upon our funds, yet the statement of accounts shows a sufficient balance in hand to warrant the publication of a full-sized number of our Transactions for the year.

Our meetings have been fairly well attended and supplied with papers, many of them of much interest; in May our Secretary read us an excellent paper on "Aphides," since published elsewhere. In June and September Mr. Stevenson kindly read to us two papers on Swans, which form part of his forthcoming volume on "The Birds of Norfolk." In August, Mr. J. H. Gurney favoured us with some very valuable notes on Zoology and Ornithology made by the late Miss Anna Gurney of Northrepps, and

which, with notes by Dr. Lowe and Mr. Stevenson, will be found in our Transactions. In October, Mr. J. B. Bridgman read a paper recording the capture of *Macropis labiata*, a bee of great rarity; Mr. Bridgman has also promised us a list of the *Hymenoptera* of the county, which, coming from such hands, we may expect to be of great value. In January, Lord Kimberley sent us a list of birds which he has himself observed on his own estate, and which we gladly avail ourselves of his lordship's permission to publish. The Rev. H. P. Marsham entrusted our Secretary with the journal of his great-grandfather, Robert Marsham, Esq., F.R.S., of Stratton Strawless, together with many other original and unpublished records, continuing the observations on the "Indications of Spring" down to the year 1874, and has kindly authorised Mr. Southwell to make and publish in our Transactions selections from them; for his kindness and confidence our warmest thanks are due to Mr. Marsham.

Our absent friends, Mr. Hampden G. Glaspoole and Mr. C. G. Barrett, have not forgotten us. The former sends us a copy of the letter of Sir J. E. Smith on the Norwich School of Botanists, originally published in the "Transactions of the Linnæan Society," which appears of quite sufficient interest to be worthy of republication, and the latter has sent us an original paper on the Wild Cattle of Chillingham Park, which was read at the February meeting, and which is, I think, the most interesting paper of our year. It falls to the lot of very few naturalists to have such an opportunity of observing this most curious herd as Mr. Barrett enjoyed, or having such good fortune to be able to record what they saw in his lively and pleasant style.

Our excursions during the past year have not been very successful, with the exception of one in July to Diss and its neighbourhood which will be remembered with much pleasure by all who took part in it. On arriving at Burston station the party proceeded to Burston rectory, where they were kindly received by the Rev. H. Temple Frere, who showed them his magnificent collection of British birds, including the only specimen of the American meadow starling (*Sturnella ludoviciana*) known to have been killed in Europe, and

one of the finest series of ruffs and reeves preserved in any Norfolk collection. From thence they went to Winfarthing to see the "Winfarthing Oak," where Mr. Amyot read a paper giving the history, so far as known, of the venerable tree, which he allows us to publish in our Transactions. From Winfarthing they went to Roydon rectory, where the Rev. T. C. Hose welcomed them with the most liberal hospitality, providing a splendid luncheon laid out in the garden of the rectory. After luncheon the party went to Roydon Fen under the guidance of Mr. Frere, who showed them one of the choicest rarities among the fen plants known to grow there, *Liparis lœselii*, also two species of *Utricularia* and other bog plants of more common occurrence. From Roydon they returned to Diss, and before leaving took a very hurried glance at the curiosities collected at Diss rectory. To all those kind friends who helped to provide the enjoyment of that day, to Mr. Amyot, Mr. Frere, the Rev. Temple Frere, the Rev. C. R. Manning, and especially the Rev. T. C. Hose, are due the hearty thanks of every one who joined the excursion. I have myself a special cause for thanks, for I was shown that day the only locality I know of in the county, for the beautiful little fern *Cystopteris fragilis*.

Many interesting objects have been exhibited at our monthly meetings, among which may be specially mentioned a collection of seventy-five species of British bees by Mr. J. B. Bridgman; a beautiful little nest of the harvest mouse from Stalham, and many interesting plants by Mr. Bayfield and Mr. R. P. Burcham.

Having thus briefly reviewed the proceedings of our past year, I come now to the most difficult portion of my duty. It is usually expected of a retiring President, that he should have some original observations to report, or fresh views on some subject connected with the objects of the Society to which he belongs to communicate. Here I must ask your indulgence; I have neither time for observation, or talent for the expression of original thought, and I must ask you to pardon me, and to accept, instead, a few dull remarks based almost entirely upon the thoughts and sayings of other men.

I suppose that one of the uppermost subjects of thought among

all of us who love natural science, is the question—how far the theories of development and evolution, commonly called Darwinism, are to be considered as having been established, and are to be received as a solution of the difficult problem of the origin of species, and as a step towards that of the still more obscure problem of the origin of life; and while we look with the utmost regard on that masterly course of observation and reasoning which has taught us so clearly how varieties are formed within species, as, for instance, among domesticated animals, we some of us, perhaps, hardly see our way to accept development as the origin of species themselves, or evolution as the means by which all the forms we meet with have been produced from one source, or from a few original types.

In the first place, we are puzzled to know where varieties end and species begin; and those who should be best informed on this point, seem in many cases not at all more certain than we are as to their limits; the views of the same authority differ widely from time to time, and different authorities hold diametrically opposite views. Let us take, for example, the group of British Batrachian Ranunculi. In 1851, Professor Babington described them as seven species, and three varieties; but in 1874 he divides them into thirteen species and one variety; while Dr. Hooker, in 1870, gives but three species, describing all other forms as sub-species or varieties, and says, "the species of this section are considered by some authors as forms of one or two, by others as twenty to thirty." Nor have I chosen at all an extreme example; some of the other "critical genera" of British plants would show a still wider discrepancy between the views of our leading botanists, forcing us to the conclusion that our conception of species is too narrow: that the variation of form, colour, and even of structure, that may exist among varieties within the limits of a species, is very much greater than we are apt to admit; and that before we are at all prepared to consider "species" as the unit of development, we shall have to get rid of a good many notions founded on taxonomic arrangement and in the words of one of our greatest English botanists, "the time will ere long arrive when what are now called genera, or sub-genera, will alone be considered species."

I will try to illustrate what I mean by an example drawn from our own immediate neighbourhood. No doubt we are all acquainted with the genus or sub-genus Polystichum among the British ferns; now the forms of this genus, occurring in Great Britain, have been variously described by those to whom we look up as authorities, as being divided into four species—three species—two species, three sub-species, and one variety—three species, fourteen varieties, and about fifty distinct forms. But from a tolerably intimate acquaintance with this genus as it is found in Britain, having observed it in most of its states, ranging from the tiny mountain form of Louchitis, of a few inches, to the luxuriant Devonshire forms of Angulare, of seven feet long; I venture to suggest that, after all, they are but one species, for on the heavy lands lying west of Norwich, may be collected some twenty to thirty different forms, from one closely resembling the mountain simply pinnate form, through varying shades of division, to the almost tripinnate form, which is the most divided state known in the British Isles. There they are by hundreds, growing side by side, shading off so gradually from the simple to the compound form, that it is virtually impossible to say where one begins and the other ends; and here we have, within the limits of the species thus considered, the utmost laxity of variation, but this laxity goes no further than the species; interspersed with Polystichum are numbers of other ferns, of very closely allied sub-genera—Lastrea, for instance, but among them all, you will not find one single individual plant that holds an intermediate place between the genera; there is no attempt at fusion, they grow, and doubtless have grown thus together for an immense number of generations, yet they remain perfectly distinct.

But if we are in doubt in defining the limits of a species, how much will our difficulty increase when we consider that if evolution in its fullest sense is to be accepted, we shall have to come to the conclusion that there is really no such thing as species at all; and that "the same question, in a wider sense, and taking into consideration a much longer time, would be applicable to genera and families." Of course the very essence of the theory of evolution is the, to our comprehension, almost unlimited time, supposed to be

demanded by the records of the rocks, the ages upon ages required for the formation of the stratified rocks, which form so large a portion of the crust of the globe, and which contain the records of all the past life of which we have any knowledge. But it may be fairly doubted whether the theory of uniformity of both action and energy, on which the enormous amount of time claimed for past geological changes is based, has not been pushed too far; forces similar in kind to those at present in action have, no doubt, had their share in time past in the degradation of the older, and construction of the newer rocks; but it does not follow either that no other forces were in simultaneous operation with them, or that the energy with which they themselves acted, may not have been considerably greater than it is at present. The newly-appointed Professor of Geology at Oxford, in his Inaugural Lecture, delivered a few weeks ago, answers the question whether all former changes of the world's surface are to be explained by the agency of forces alike in kind and degree to those now in action in the negative. If the doctrine of uniformity has been carried too far, we may eventually come to regard the first appearance of life upon the globe as not so far distant as has sometimes been imagined, and the steps of variation in the structure of the fossiliferous strata as not having occupied the vast space of time which has been sometimes claimed for them. Professor W. C. Williamson, in his lecture on Primæval Vegetation considered with reference to the Origin of Species, says, "that if we ask an evolutionist what the conditions are that he requires for the demonstration of the truth of his position, he would tell us at once—unlimited time." If, then, there be any doubt about the time, as Mr. Prestwich seems to indicate that there may be, that doubt will weaken the theory of evolution at its very root.

I have said that if species are to be considered unstable, genera and families must be considered so also. Are we then to regard all the forms of animated nature which we see around us, animal and vegetable alike, as mere forms of transition, without any definite boundaries, varying indeed in very long cycles, but liable to vary in either direction as they may be pressed by external circum-

stances?— for if we acknowledge the development of progress, surely we must acknowledge that of retrogression also. I think not! and if you will allow me, I will quote the opinion of the late Dr. Hugh Falconer, a competent judge on the subject, you will probably consider. In an essay containing general observations on the living and extinct species of elephants, he thus expresses himself:—

After stating that he finds the characters derived from the molar teeth, and from the organs of locomotion in the Mammoth, to show that the species retained its specific character unchanged from first to last, "If we cast a glance back on the long vista of physical changes which our planet has undergone since the Neozoic epoch, we can nowhere detect signs of a revolution more sudden and pronounced, or more important in its results, than the intercalation and subsequent disappearance of the Glacial period. Yet the 'Dicyclotherian' Mammoth lived before it, and passed through the ordeal of all the hard extremities which it involved, bearing his organs of locomotion and digestion all but unchanged." And again, after acknowledging that he does not think that the Mammoth made its appearance suddenly after the type in which its fossil remains are presented to us, but that it is in some shape the modified descendant of earlier progenitors, he says, "Another reflection is equally strong in my mind, that the means which have been adduced to explain the origin of species by 'Natural Selection,' or a process of variation from external influences, are inadequate to account for the phenomena. The law of Phyllotaxis, which governs the evolution of leaves around the axis of a plant, is nearly as constant in its manifestation as any of the physical laws connected with the material world; each instance, however different from another, can be shown to be a term of some series of continued fractions. When this is coupled with the geometrical law governing the evolution of form so manifest in some departments of the animal kingdom, *e.g.* the spiral shells of the mollusca, it is difficult to believe that there is not in nature a deeper seated and innate principle, to the operation of which 'natural selection' is merely an adjunct."

But if the evidence of persistence in the character of a species,

notwithstanding great changes in the external circumstances under which it lived, be so weighty in the case of the Mammoth, who was, geologically speaking, quite a late comer on the earth, and has been for some time extinct, how much more pressing will be the argument to be derived from some of the lower forms of life, which appeared much earlier in the world's history, and are still in existence. When Professor Huxley, in his lecture on chalk, delivered in Norwich, told us that he could detect no difference between the Globigerina of the chalk formation, and the same shell brought up from the mud of the Atlantic at the present time, he seemed to me to state a fact proving a persistency of species in one instance, while change went on in others, very damaging to any theory of evolution, and the only explanation on this point that I have been able to obtain from the advocates of such a theory has been, that as Globigerina lives at the bottom of the sea, in great depth of water, the conditions of its life might perhaps, after all, not have changed so very much since the chalk period. But this explanation no longer holds good; it has been shown quite recently, by the researches of the "Challenger" expedition, that Globigerina is, to a great extent, a surface-living animal. Now I suppose that no one will believe that the conditions affecting a minute surface living shell have not varied very much during and since the deposition of that enormous chalk bed which lies beneath our feet as we sit here to-night, a thousand feet in thickness, and which has been succeeded by the variation in temperature described by Dr. Falconer, so that if the Mammoth deserves a Dicyclotherian epithet, surely Globigerina may claim to be called a "many-cycled" shell.

But even this example of persistence of type fades into insignificance before a newly-reported example in a low form of vegetable life. If the observations of the Count of Castracane on Diatoms found in coal should be confirmed, some forms of Diatoms have remained virtually unaltered since the carboniferous era. Now, if this should prove to be the fact, these forms must have survived enormous alterations of condition, so enormous, that if external circumstances really are the causes and the controllers of change of

form and structure, it seems impossible that any species should have survived unaltered what they must have passed through.

Having very briefly mentioned a few of the difficulties which seem to me to lie in the way of our accepting any theory of development as the history of the origin of true species, some of which seem to have a power of persistence setting at nought the force of external circumstances, I will venture to ask you to consider one or two points in what we know respecting that immensely more obscure and difficult problem—the Origin of Life, which seem to me to indicate that inherent qualities, rather than the pressure of outward circumstances, are really the great determining forces which govern alike the development of both individuals and species.

The latest theory of the origin of individuals, in both the animal and vegetable kingdom, so far as I am aware is, that each one springs in the first instance from a little lump of protoplasm, without any enclosing membrane, the next state being that of the "primitive cell," possessing a simple membranous coat, "neither can any distinction be found between the primitive animal and vegetable cell." "At this point all means of distinction between the vegetable and animal organism end, and no feature exists which, in the present state of science, can enable even the most distinguished microscopist to determine to which of the two kingdoms the individual cell belongs, since it possesses characters common to both."

We have, it is true, by what has been sarcastically called the "habit of spying into nature with magnifying glasses," learnt what are the different steps of growth which lead from the first cell up to the fully developed organism; we know, in fact, exactly how the growing plant or animal will be built up until it becomes the perfect individual; but with all our knowledge, we have not learn anything, either of the force which creates the cell, or of the force which causes the cell to start on its course of growth. As has been well said of the force of gravitation, "no further insight into why the apple falls is acquired by saying it is forced to fall, or it falls by force of gravitation; by the latter expression we are enabled to

relate it most usefully to other phenomena, but we still know no more of the particular phenomenon, than that under certain circumstances the apple does fall." Even so it is with growth; we know exactly how the cell will behave, we can describe the steps of its progress, and we call this process growth, and rightly so too, as a comparative term, but all we really do know is, that under certain circumstances the cell grows; and in spite of all that we have learnt, the grand problems which puzzled the wise man of eight and twenty hundred years ago, remain for us just as much unsolved as they were for him. We have learned, so to speak, all the mechanics of the process, but the wise men of our day can no more explain how that process comes about in the first instance, than Solomon himself could.

If it be correct, as no doubt it is correct, that the primitive cells of animals and vegetables are so nearly alike that we cannot distinguish between them, this surely is only a proof of our want of power to discern differences that we must certainly believe to exist; for if we suppose one cell to be the parent cell of a highly organised animal, and another of an equally highly organised vegetable, it is clear that the two cells must be endued with totally different potentialities, the presence of which we fail to perceive, and not only with potentialities, of which we have heard a good deal, but also with necessities of development, of which, I think, we have heard too little. Each of these two cells not only can, but must, develop into a perfect individual of its own kind; it has no choice, it cannot stop short at any particular stage and complete its life there, it must either attain its perfect growth, or become sterile and die. We know that in the process of growth highly organised animals, and plants also, pass through temporary stages which represent the perfect states of less highly organised families; but we find that there is no power in the growing individual to arrest its growth and complete its life at any one of these stages, short of the ultimate one belonging to its own family, and if all the organisms which complete their growth at these different stages start from what are, to our comprehension, precisely similar cells, we must, I think, acknowledge the action of some inherent com-

pelling and controlling force which we can neither appreciate nor comprehend.

I believe that in attempting to solve such problems as these, we may be compared to men trying in the dim twilight before dawn to follow a very faintly marked path over broken ground; by much labour and thought we gain continually a few inches, and every now and then, when we think we see before us a fair stretch down hill, as in the first flush of the discovery of such a doctrine as "uniformitarianism" or "natural selection," we make a rush forward, only to overrun the path, and to have to return painfully for some distance, in order to pick up its traces again, in advance truly of the point where we began to run, but far behind that which we had thought to reach; as we travel on, the light slowly brightens; but for the perfect light of day, which shall enable us to clearly understand these mysteries, I look not in this world. As says a great man, from whom I have borrowed much to-night in both thought and word, "In all phenomena, the more closely they are investigated, the more we are convinced that, humanly speaking, an essential cause is unattainable—causation is the will, creation the act of God."

I.

THE WINFARTHING OAK.

By T. E. Amyot, Diss.

Read before the Society, at Winfarthing, July 7th, 1874.

There is a venerable story suiting the venerable subject of my paper, of which I will make a preface. A poor preacher having observed an eminent statesman among his congregation, and being anxious for a word of praise from so great a man, had the rashness to ask him, after service, what he thought of his sermon. "Well, sir," was the civil reply, "it was very short." "Yes," said the preacher, wishing to elicit something more satisfactory, "I never like to be tedious." "Oh, but you *were tedious*," answered the statesman. Now I will assure my audience that my paper *will* be short, but I will by no means assure them that it will not be tedious.

At the time of the Norman Conquest a forest occupied the spot where we are now assembled. In the reign of Henry III the manor of Winfarthing was given to Sir William de Montchesnie by the king, in reward for his military successes against the French, and the son of this knight had a large park here, well stocked with deer, and had liberty to hunt the hare, fox, and wild cat, in his wastes and forests. In 1604 the park still abounded with deer, but it was afterwards enclosed by the Earl of Arundel.* This information is afforded by Blomfield, but of this grand old tree, which is said to have been called the "Old Oak" in the time of the Conqueror, and which must have formed the chief ornament, both of forest and park, he says not one word; nor, indeed, (as far as I have been able to ascertain,) is much information concerning it to be found prior to 1836, when the following passage occurs in a letter addressed by the late Mr. Samuel Taylor, of Whittington,

* A capital description of the old Winfarthing forest and its surroundings will be found in a book for children, called the "Chronicles of an Old Oak," by the late Miss Emily Taylor.

to the author of the "Arboretum et Fruticetum Britannicum." It is quoted in every description of the tree, but I must be excused for repeating it, as there are one or two points in it on which I wish to touch.

"Of the age of this remarkable tree," he says, "I regret to be unable to give any correct data. It is said to have been called the 'Old Oak' in the time of William the Conqueror, but upon what authority I could never learn. Nevertheless, the thing is not impossible, if the speculations of certain writers on the age of trees be at all correct. Mr. South, in one of his letters to the Bath Society, (vol. x) calculates that an oak tree 47 feet in circumference cannot be less than 1500 years old, and Mr. Marsham calculates the Bentley oak, from its girthing, (34 feet) to be the same age. Now, an inscription on a brass plate affixed to the Winfarthing oak, gives us the following as its dimensions—'This oak in circumference at the extremities of the roots is 70 feet: in the middle, 40 feet, 1820.' Now I see no reason, if the size of the rind is to be any criterion of age, why the Winfarthing oak should not at least equal the Bentley oak; and if so, it would be upwards of 700 years old at the Conquest, an age which might well justify its then title of the 'Old Oak.' It is now a mere shell, a mighty ruin, bleached to a snowy white, but it is magnificent in its decay, and I do wonder much that Mr. Strutt should have omitted it, in his otherwise satisfactory list of 'Tree Worthies.' The only mark of vitality it exhibits is on the south side, where a narrow strip of bark sends forth a few branches, shown in the drawing, which even now occasionally produce acorns. It is said to be very much altered of late, but I own I did not think so when I saw it about a month ago, (May, 1836,) and my acquaintance with the veteran is of more than 40 years' standing, an important portion of *my* life, but a mere span of his own." (Gardeners' Mag., vol xii, p. 586.)

Now, this is a very valuable letter, as it gives us good ground for concluding that the health and vigour of our old friend have undergone no perceptible deterioration in 78 years; for the author, writing in 1836, states that he had known the oak for more than 40 years, which carries us back to 1796, and we ourselves can testify this day that his condition is at least as good as in 1836, when "*its only mark of vitality*" is said to consist "*of a narrow*

strip of bark which sends forth a few branches, which even now occasionally produce acorns." And thus we have a trustworthy record of 78 years, as I have said, viz., from 1796 to 1874. The sketch, too, which accompanied the letter, and which is engraved in Loudon, and a larger figure at page 1775 of the same volume, both bear out the conclusion that a lapse of time, which would convert a little baby into a very old man, has left little or no mark on his iron frame, and as to his production of acorns, there were plenty when I visited him in 1866, thirty years after the date of Mr. Taylor's letter, and one of them taken at that time is now a promising young eight-year-old in my garden, having the magnificent circumference of two inches, at a distance of four inches above the soil, and this, in spite of rather rough usage and several transplantings since his acornage. Grigor, in his "Eastern Arboretum," published in 1841, gives an excellent drawing, by Ninham, which again bears out the idea that improvement has taken place since the date of its publication, and my own recollection of the tree, which extends from 1848, when I made a rough sketch, which I still possess, strongly confirms this.

As to the authority for its having been called the "Old Oak" in the time of the Conqueror, I, like my betters, can find nothing, although I have had the able assistance of Mr. Manning. To him, however, I owe some encouragement for continuing the search, as he thinks it may possibly be mentioned as marking a Saxon boundary, in some such books as "Rymer's Fædera," or "Kemble's Codex Diplomaticus ævi Saxonici," which was published by the "English Historical Society;" to these, therefore, I would direct the attention of such members of this Society as may have leisure for the pleasant task. There is no mention of the tree in "Doomsday Book," or in "Dugdale's Monasticon." Whether such authority can or cannot be found, however, there can be little doubt, if we may trust to the opinions of such men as De Candolle, South, and Loudon, that it *was* an old oak at the time stated. I will not say that it is the oldest oak in Great Britain, because there are so many *oldest* oaks, according to various writers, that the position would not be one of distinction; and in considering the numerous claims made to it, one is forcibly reminded of the curiosity collector who expressed his disgust and disappointment at not finding the tomahawk which killed Captain Cook in a certain museum, stating

that he had thought that no *good* museum would be without it. My hearers will remark that the old tree has been well girded with iron, and shored up by wooden props; the latter, however, are so densely overgrown with ivy, that they greatly obscure the outline of the tree, and a free clearance of undergrowth from its vicinity is greatly to be desired, as it is now impossible, from any one position, to get even a fair idea of the extent and magnificence of the ruin; and to obtain a satisfactory sketch of it is, of course, equally out of the question.

In younger and sounder trees an approximative guess as to age may be made from their diameter; or, when felled, from the number and width of their concentric annual wood layers, but a hollow tree appears, after a certain age, (like many people of a certain age,) to be somewhat backward in registering its birthdays, or, in other words, in adding to its external circumference by the addition of its annual ring. The explanation of this would seem to be, that the new deposit of wood has freedom to extend itself inwardly towards the rotting centre, and finds less resistance in that direction than outwardly towards the cortex. But, at any rate, one fact of interest may be gathered from the measurement of this old trunk. In 1820, as appears on the brass plate, its circumference was 40 feet near the middle, and 70 feet at its roots, and when I last measured it in July, 1873, it was exactly the same. Thus, in 53 years, it has added nothing to its circumference, (owing probably to the cause I have just alluded to,) and it seems to me very probable, that for many a fifty-three years it may have been stationary, or nearly stationary, its new wood rather tending to decrease its inside area than to enlarge it externally. It appears then, to be impossible to estimate the age of such trees as this by their measurements, and as the matter stands, we must be content with Mr. Loudon's estimate, which gives it the age of about 1500 years. May it be long before there is an opportunity of making a better guess by counting its annual rings!

It may not be amiss to give a glance at a few of the oaks of Great Britain, of which something is known regarding age as well as size, by way of comparison.

On the 11th of September, 1848, (a perfectly still day,) St. Edmund's Oak, a magnificent tree, which I well remember in all its majesty and beauty, fell at Hoxne, about five miles from Diss.

To this tree, according to tradition, King Edmund was bound by the Danes in the year 870, and pierced by their arrows; and the story was curiously confirmed, after its fall, by the discovery of an iron arrowhead, or at least of a piece of iron, which looks more like the point of a weapon than anything else, imbedded in its trunk. This curiosity is in the possession of Sir Edward Kerrison, of Oakley Park. The circumference of the tree was 18 feet, and it contained 16 loads of timber, "the tree itself not more than four or five loads, but its branches were enormous;" * and as its age (supposing the tradition to be true) must considerably have exceeded a thousand years, (for we will not suppose that the king was bound to a mere sapling,) it is worth examining the number and width of its annual rings, to see how fast it made wood in its older days.† Here is a piece of its wood, necessarily the wood of its older days, as the tree was very hollow; I have measured off 7 inches, and marked with dots the divisions of the concentric rings; there are 56 of these, giving an average of 8 to the inch, but, of course, in calculating the increase of the diameter of the trunk by this means, we must consider the rings as a quarter of an inch wide, as the circles will be cut twice by the measure. This observation, however, would not hold good were we employed in measuring the rings of the old tree under whose shade we are standing, for only a very small part of it, in proportion to its bulk, is living; and the production of new wood must have been long confined to a very small segment of the circle.

A few days ago I took the circumference of twelve oaks standing in the avenue leading from Brome Hall (near Diss) to the road. I selected these because I knew that there was documentary evidence in existence as to their age, and, in answer to a note, Sir E. Kerrison kindly informs me that they were planted 125 years ago. They are fine, well-grown trees, without irregularities to impede measurement, and their circumference varies from 11 feet (the largest) to 7 feet 6 inches, (the smallest,) the average of

* Note from Sir E. Kerrison, received July 6th.

† It appears to be a strange thing, and a fault that the writers on trees give no information as to the number of measurement of concentric rings in the trunks of those ancient trees which have fallen, as such knowledge would greatly assist us in forming a correct opinion as to their age.

the twelve being 9 feet 2 inches. As to other trees of which something is known, we have

Cowper's Oak, above 1500 years old, according to Loudon, circumference 47 feet.
Cowthorpe Oak, 1600 years old, „ 48 feet.
Nannau Oak, hollow in Henry IV's reign, fell in 1818.
Leaden Oak, marked as "too old for naval timber, in Cromwell's time, circumference 30 ft. 6 in.
King Oak, (Windsor) 1000 years, according to Loudon. "A favourite tree with the Conqueror." circumference 26 ft.
Flitton Oak, 1000 years, according to Loudon, „ 33 ft.
Swilcar Lawn Oak, 1000 years, "known by historical documents to have been a large tree 600 years ago, circumference in 1830, and 54 years before, at same height, only 19 feet. 21 ft. 4 in.
Bentley Oak, blown down in 1781. In 1759 it was and 20 years afterwards had only increased 1 inch. 34 feet,

The above list is worth attention, as showing the slight connection which may exist between age and size. Thus the Swilcar Oak had increased 2 feet 4 inches in circumference in 54 years, while in exactly the same time our friend above us has remained unchanged. The Bentley Oak increased but one inch in 20 years, and the St. Edmund's Oak had only 18 feet of circumference to show for his 1000 or 1100 years of life.

Let me hope, if we ever meet again at Winfarthing, we shall find the "Old Oak,"—I was going to say, *restored*, but a late pleasant trip with a party of Archæologists has left an impression upon me that the word *"restoration" may* mean mischief, so I will only say, cleared of its evil surroundings.

I must not close this paper without a word about the magnificent and picturesque ruin of an ancient oak which stands in an adjoining meadow. It is well situated for observation, and is probably but little younger than the one under which we are standing. It is, however, going rather rapidly to decay, and I observe a marked difference for the worse in its condition, particularly in the death of a branch to the north, since I visited it 26 years ago. Last year (July, 1873) I measured it, and found its circumference two feet from the ground to be 30 feet, and its height 37 feet.

That these notes and measurements may be of use to some member of the Norfolk and Norwich Naturalists' Society, when he visits these old monuments a hundred years hence, I most earnestly desire. At any rate I will not imitate that selfish man who refused to do anything for posterity, on the ground that posterity had never done anything for him!

Since writing the above, Mr. Southwell has kindly forwarded to me a most interesting extract from the journal of R. Marsham, F.R.S., formerly of Stratton Strawless, in which he gives the measurement of the two old oaks at Winfarthing in the autumn of 1744. The circumference of *the* oak, which is the subject of my paper, was then 38 feet 7 inches, so that its present girth of 40 feet shows it to have increased 17 inches in the 130 years, while the old tree which I have mentioned as standing in an adjoining meadow, has remained *in statu quo*, measuring then as now 30 feet.

To Mr. Southwell I am also indebted for the following excellent suggestion;—he proposes that whenever an old tree is photographed, a piece of paper of known measurement, say twelve inches square, should be attached to its trunk, so that by simple comparison, the dimensions of the tree may be easily ascertained.

T. E. A.

II.

EXTRACTS FROM THE NOTE BOOK OF THE LATE MISS ANNA GURNEY, OF NORTHREPPS.

COMMUNICATED BY J. H. GURNEY, F.Z.S.

Read 25th August, 1874.

THE late Miss Anna Gurney, of Northrepps Cottage, near Cromer, kept for some years notes of such zoological occurrences in that neighbourhood as she deemed worthy of record, and the following extracts from these notes may perhaps prove of some interest to the Norfolk Naturalists' Society. Where no place is specified, the facts mentioned are believed to have occurred in or near the parish of Northrepps.

1820. Nov. A little bustard shot at Mundesley.[1]

1821. Oct. A specimen of the greater water newt, taken from a well at Northrepps ninety feet deep.

Nov. 9. A Ray's bream found after a storm on Cromer beach.[2]

1822. March 9. A whale was entangled among the rocks off Overstrand, and killed by the fishermen. Its dimensions were—length, 57 feet; breadth, 13 feet; pectoral fins, 6 feet 6 inches; tongue in length, 9 feet, ditto in breadth, 4 feet.[3]

1828. May 10. Slow-worms—young one going into its mother's mouth.

June 14. An osprey shot at Felbrigg.[4]

„ 22. A wryneck taken from its nest, ate ants' eggs from the hand.

1829. Jan. An eagle seen at Felbrigg, Beeston, and Gunton.[5]

April. A crossbill's nest at Sherringham.[6]

April 24. A *shark* killed near Cromer, near eight feet long, of the bottle-nosed kind; it was hunting porpoises, and had one *in its mouth* when it got into shallow water and was killed.[7]

April 19 to 26. Flocks of Kentish crows assembled for flight on the cliffs this week—one seen on the 26th.[8]

May 7. A couple of woodcocks flushed at Northrepps.

June 15. Saw a pair of stints on the shore at Cromer.[9]

Aug. 11. Young golden plover caught.

Oct. 21. Rough-legged buzzard shot at Northrepps.

„ 22. Flocks of larks and hen chaffinches seen coming over.

Dec. 23. A whale entangled and killed on the rocks at Runton. It was 24 feet long; the extreme width of the tail was 3 feet 11 inches; the jaws were 2 feet 7 inches long, and lined with nearly white whalebone fringe; it was black on the back, below white, and in folds; the nose was sharp-pointed, and the blowholes close together in the middle of the head. The blubber was about an inch and a half in thickness; a steak cut from it tasted, when cooked, like tender beef.[10]

Dec. 21. An eagle seen at Beeston.

1830. Feb. 4. Three starved scaup ducks brought to us, (at Northrepps Cottage.) Out of eighty ducks brought to Northrepps Hall about this date, seventy were scaups.[11]

June 3. Hard rain; many old hen pheasants drowned on the Cromer Hall estate.

Sept. 16. E. C. Buxton shot a white flycatcher.

Nov. 1. Spear ray, or Fire-flaire. The tail of this fish had two spikes, the old one and another growing.[12]

Nov. 5. Larks coming over.

„ 13. A little grebe taken at sea, weighing 6 oz. 30 gr.; length 12 inches from end of beak to feet, 15 across wings.[13]

1831. Jan. 6. A hundred swans passed over Weybourne, going to the N.W.[14]

Jan. 27. An eagle seen at Beeston.

June and July. All June and July a woodcock seen in Curtis' garden at Runton.[15]

Aug. 6. A woodcock shot.

„ 7. Another woodcock seen, also an eagle, and many large hawks over.

Nov. 16. In the evening a stream of larks was seen coming from over the sea at Weybourne, also many hawks and ducks.

Nov. 16. A red phalarope shot at Sherringham.

1832. Jan. 28. A large eagle seen at Sherringham.

Jan. 30. An osprey at Hempstead.

July. A buff-breasted sandpiper shot at Sherringham, by Mr. A. Upcher.[16]

Oct. 8. A spoonbill brought us from Weybourne.

„ 18. Vast flocks of small birds (larks and finches principally) coming over the sea all day; they were observed from Weybourne to Cromer—wind light.

Dec. 31. Nine vipers found in a hole in digging up a plantation at Sherringham.

1833. April 8. A large sole caught on a line; length, 19 inches, breadth, 8 inches, weight, 3 lbs.

Sept. 18. A rough-legged buzzard.

„ 19. Two great grey shrikes seen by E. C. Buxton.

„ 21. Two rough-legged buzzards seen by E. C. Buxton.

„ 27. A white lark seen in a flock by E. C. Buxton.

Oct. 14. A white-winged golden plover shot by T. F. Buxton.

Dec. 24. A three-bearded rockling caught.[17]

1834. May 25. During a gale a gannet was taken at Trimingham asleep, beneath a bank near the cliffs; it died a few days after it was caught.

Oct. 14. The decoy-man at Hempstead reports that nearly a thousand teal had come over.

Nov. (second week.) Two eagles seen (at or near Northrepps.)

1835. Jan. 20. Several waxwings shot about this date.

Above a thousand teal taken this winter in Hempstead decoy.[18]

Two avocets shot this spring at or near Salthouse.[19]

May 25. Woodcock's nest at Weybourne, four young ones; one killed three-quarters grown.

Oct. 26. A sea-eagle shot near Cromer, by Mr. Edward Hoare, 7 feet 8 inches from tip to tip.[20]

1836. Nov. 13. A sun-fish found on Overstrand beach, length, 4 feet 6 inches; fin to fin, 5 feet 1 inch; across shoulders below the gills, 2 feet 8 inches.[21]

Dec. Two tadpole fish caught this month off Cromer.[22]

1837. May. A ring ouzel killed at Northrepps.

June 13. A stoat killed, with white on its shoulders and the upper part of the neck.[23]

1839. June 12. A foolish guillemot's egg found on Cromer beach, and another the following day.[24]

1856. Nov. A white woodcock shot at Baconsthorpe.

The initials attached to the notes are those of the following local authorities—John Henry Gurney, John Lowe, M.D., Henry Stevenson, and Thomas Southwell.

[1] I possess a coloured drawing, made by Miss Gurney, of this specimen, which is, as was to be expected, in winter, or perhaps female plumage; this is an earlier occurrence than any of those recorded from Norfolk, in Stevenson's "Birds of Norfolk," vol. ii, p. 43.—J. H. G.

[2] Ray's bream. *(Brama raii. Bl.)* Only two other Norfolk specimens have been noted, both of which were taken at Yarmouth, though a few others are believed to have occurred.—J. L. Miss Gurney made an accurate coloured sketch of this fish, which was a full-sized specimen.—J. H. G.

[3] There is nothing here to indicate the species, probably it was *Balænoptera musculus*, Lin. *(Physalus antiquorum* of Gray,) the species which occurs most frequently on the British coast. The specimen mentioned Dec. 23rd, 1829, was doubtless *Balænoptera rostrata* (Fab.) as indicated by its small size and white baleen. Both these specimens are mentioned in a note to Wilkin's edition of Sir Thomas Browne's Works, at p. 324, vol. iii.—T. S.

[4] The appearance of the osprey on our coast in June is unusual, but other instances have been known of late years.—H. S.

[5] *Sea eagle.* The frequent record, by Miss Gurney, of sea eagles seen, or shot, on the coast, during the winter months, shows the regularity of the movements of this species, as proved by more recent observations, the young birds only visiting the Eastern counties. The recorded appearance of one on Aug. 7th, 1831, is so unusual, that I should almost suppose the bird seen to have been an osprey.—H. S.

[6] The notice of a crossbill's nest at Sherringham, in April, 1829, is, on such authority, an important fact, as the appearance of these birds in Norfolk, during the summer months, has long suggested the probability of their nesting, at least occasionally, in our extensive fir woods, though I know of no other record of the kind. In the north of Europe these birds breed early, and those occasionally seen here in June and July, a e quite likely to be old and young already passing south after the breeding season, but April would scarcely be too late for a nest in this county.—H. S.

[7] Probably a cetacean, and one of the *Delphinidæ* is here referred to, as the mode of taking its prey is not that of the shark. Possibly *Delphinus tursio* (Fab.)—T. S.

[8] The notes on the arrival and departure of migratory species, the assembly of Kentish crows on the coast, in April, prior to their north-

ward journey, and the arrival of larks and finches in autumn on the Cromer coast, are evidences of close and accurate observation; and, as regards the small bird immigration at the close of the year, bearing out Sir Thos. Browne's remarks, that such flocks consist not only of one kind, "but teal, woodcocks, fieldfares, thrushes, and several birds come and alight together, for the most part some hawks and birds of prey attending them."—H. S.

[9] The occurrence of a pair of stints (dunlin) on the 15th of June, 1829, and of young golden plover on August 11th, are both early dates for the southward passage of both species; the stints possibly had remained here, though without breeding, throughout the summer.—H. S.

[10] See note [3].

[11] The large number of scaup ducks, in Feb., 1830, is interesting; this, unlike the common scoter, not being a particularly abundant species on our coast in winter. The enormous take of teal in Hempstead decoy, during the winter of 1885, over a thousand, is a most important record, now that nearly all our decoys are closed, and the condition of the fenny parts of the county so greatly altered.—H. S.

[12] Spear ray or fire-flaire, (*Trygon pastinaca L.*) This is a rare fish, having been observed in only six other instances. The double spine was found in a specimen seen by Mr. J. H. Gurney, at Kessingland, in 1856, and is also mentioned by Couch. A specimen occurred at Cromer in 1874.—J. L.

[13] The capture of the little grebe at sea throws some light upon what Lubbock describes as the mysterious appearance and disappearance of this species upon our broads and rivers; that they do migrate, as well as the great crested, there is, I think, no question, notwithstanding their apparently feeble powers of flight, and preference for diving as a means of safety. Only last spring one was caught in the sea under the new pier at Brighton, riding on the waves.—H. S.

[14] The hundred wild swans seen passing Weybourne in Jan., 1831, no doubt marked a severe winter, though not amongst those specially recorded by ornithologists as "swan years."—H. S.

[15] Miss Gurney's notes afford several unrecorded evidences of woodcocks remaining to breed in Norfolk, including the pair seen May 7th, 1829, a pair at Runton frequenting a garden all June and July, and one shot, and another seen, Aug. 6th and 7th, and the nest of four young ones found at Weybourne in 1835. The notice of a white woodcock at Baconsthorpe, in Nov., 1856, seems a stray note made some sixteen years after the previous entries had been discontinued in 1839.—H. S.

[16] The buff-breasted sandpiper, shot in 1832, is now in the Norwich Museum.—H. S.

[17] Three-bearded rockling (*Motella tricirrata Bl.*) This is very rare, having been recorded in only two other instances.—J. L.

[18] See note [11].

[19] The avocets shot near Salthouse, in the spring of 1835, were some of those which still visited their old breeding haunt on their migratory

course, for many years after the colony in that place was broken up. As far as I know, the last Norfolk bred avocet was taken at Salthouse, about 1825. —H. S.

[20] This specimen, a bird of the year, is now in the possession of Mr. Joseph Hoare, of Child's Hill, Hampstead.—J. H. G.

[21] Sun-fish *(Orthagoriscus mola L.)* Not unfrequent on the Norfolk coast.—J. L.

[22] Tadpole fish *(Raniceps trifurcus, Walb.)* This is regarded by Yarrell as one of the rarest British species. It has been taken only two or three times on the Norfolk coast.—J. L.

[23] Although white or parti-coloured stoats are rarely met with in summer, during the winter months they are by no means uncommon in Norfolk, and the change does not seem to depend so much on the severity of the weather as has been generally supposed. In the exceptionally mild winters of 1872-3, and 1873-4, many pure white stoats were sent to the Norwich bird-stuffers, as in these winters scarcely any snow fell, this change of colour would be the reverse of a protection to them.—T. S.

[24] The eggs of this bird found on Cromer beach, in June, were most probably laid by a bird unable to fly by gunshot wound, or other accident, yet able to support itself on the coast by swimming and diving.—H. S.

III.

BIOGRAPHICAL MEMOIRS OF SEVERAL NORWICH BOTANISTS,

In a letter to ALEXANDER MACLEARY, SEC. L.S. *By* SIR JAMES EDWARD SMITH, M.D., F.A.S., P.L.S., *in the Transactions of the Linnæan Society of London, Vol. VII, p. 295.*

COMMUNICATED BY HAMPDEN G. GLASSPOOLE, ESQ.

Read November 21st, 1874.

Norwich, 14th January, 1804.

DEAR SIR—The recent death of one of my oldest botanical friends, who has long been a Fellow of the Linnæan Society, has suggested some recollections to me which may not be altogether uninteresting, and which I beg the favour of you to communicate to the Society.

Mr. John Pitchford, whose name is well known to all who are conversant with the botany of England, died here on the 22nd of December, 1803, aged sixty-six years.

He had long practiced as a surgeon and apothecary in this town and neighbourhood, especially among the Catholics, being himself of that persuasion. His moral character and truly christian spirit would have done honour to any church or sect, and he has left five children to lament the loss of a most indulgent father. I would add more on this subject, but his scientific character is more especially my present object.

Mr. Pitchford was the last of a school of botanists in this town, among whom the writings and merits of Linnæus were perhaps more early, or at least more philosophically studied and appreciated, than in any part of Britain.

Norwich had long, indeed, been conspicuous for the love of plants. A play is extant, called "Rhodon and Iris," which was presented at the florists' feast in Norwich, and printed in 1637. The taste for the cultivation of flowers was probably imported from

Flanders, along with our worsted manufactures, during the equally unchristian and unwise persecutions of the bloody Philip II. Such an innocent luxury, and so rare a taste, were not unworthy of minds which had turned with disgust from the tyranny and foul corruption of their native country. Truth, virtuous liberty, and disinterested science, are congenial and flourish under the influence of similar circumstances.

The great Sir Thomas Browne, well known by his various learned writings, who died here in 1682, appears not to have neglected botany. The *Salsola fruticosa* was first observed by him on the Norfolk coast. It does not, however, appear that systematic botany was particularly studied in Norwich till towards the latter end of the 18th century. There was indeed a set of botanists very distinct from the florists, though like them mostly in humble life, and who amused themselves in herborising in the country, and who referred their discoveries to the names and descriptions of old English authors, particularly Gerarde and Parkinson, sometimes, perhaps, to Ray. Some of these are still in being, and a Society, founded many years ago, now exists. But the numbers of these properly called botanists, have been always inconsiderable compared with the cultivators of fine flowers, who among the journeymen weavers and other persons employed in the manufacture, are very numerous, and I believe very successful. The long intercourse between this country and Holland has been favourable to their pursuit.

The oldest names I have been able to discover among the botanists is that of Mr. Wilson, a tailor, who made frequent journeys to London about the years 1738 and 1740. Part of his herbarium, very scientifically named, has fallen into my hands. From thence it appears that he collected and dried many plants from the Physic Gardens at Chelsea, and from Gray's nursery at Fulham. Among his pupils were Mr. Christopher Smart, of the same profession, and Mr. Christopher Newman, a man in a more elevated situation of life, both living in my time; as well as Mr. William Humfrey. To the latter, an amiable and communicative man, I have many obligations. He first discovered the *Lycoperdon phalloides* of Mr. Woodward, the *Buturrer* of Persoon, a most singular fungus not known in this neighbourhood. I shall only mention one more of these humble cultivators of science, Mr. Joseph Fox, a weaver, of

whom mention is made in the second volume of our Transactions, p. 315, as the first person who ever raised a *Lycopodium* from seed. He is still living at a very advanced age, and without much help from books, has as discriminating a knowledge of our wild plants as most botanists who have made a noise in the world.

"The short and simple annals" of these humble and disinterested admirers of Nature may seem, perhaps, scarcely worthy the attention of the learned and accomplished naturalist, but those who have the best claim to such a denomination will feel most interest in the success of their fellow-labourers, how far soever below their own. It appeared to me unjust to pass over in silence those whose taste, at least, and perhaps their knowledge, first excited to similar pursuits the more distinguished botanists of whom I am now to speak.

Some time about the year 1764, if I remember rightly, the Rev. Henry Bryant, at that period one of the ministers of the principal parish here, took up the study of botany as an amusement to his mind after the death of a beloved wife. He was a man of singular acuteness, well skilled in mathematics, and sufficiently master of his time to devote a considerable portion of it to his new pursuit. He was acquainted with Mr. Hugh Rose, then resident as an apothecary in Norwich, who always had a taste for botany, and with much classical learning, added to a systematic physiological turn of mind, was well qualified to assist Mr. Bryant in the study he had undertaken. Mr. Rose, however, educated in Scotland, was chiefly acquainted with Ray and Tournefort. The famous Dr. Garden was his fellow-student, who, when settled in America, and engaged in the studying the plants of that country by the principles of Tournefort, was, as himself told me, very nearly giving up the study altogether for want of a more comprehensive system.

Fortunately the works of Linnæus came into his hands, and the use he made of them is well known. Perhaps about the same period our two Norwich botanists first met with the *Philosophia Botanica*. Both of them have often related to me with singular pleasure the impressions they received from this book. At first they scarcely knew what opinion to form of it. Mr. Rose was not, I believe, without apprehension of some lurking heresies and unfounded novelties hostile to the fame of his admired Ray; but Mr. Bryant unattached to any previous system, and much attracted

by the mathematical precision of the new book, after reading it again and again became a decided Linnæan, in which his friend soon most heartily coincided with him. They procured, as soon as possible, all the other principal writings of Linnæus, as well as the "Flora Anglica" of Mr. Hudson.

Mr. Pitchford, then a student of physic in London, was acquainted with this gentleman, and by his mediation a correspondence began between Mr. Hudson and Mr. Rose, which lasted as long as the latter lived. Mr. Pitchford in 1769 settled in Norwich, and added much to the strength of its botany. Mr. Rose, in 1775, published his "Elements of Botany," a translation and epitome of many of the most useful introductory and theoretical writings of Linnæus. In an appendix to the volume some new British plants, found about Norwich by Mr. Pitchford, Mr. Humfrey, and others, are figured and described. Mr. Rose, like Mr. Hudson, transcribed synonyms very copiously without seeing the original books; but that practice has been universal among local botanists till very lately, and however disgraceful now, was much more excusable when Mr. Rose wrote. The principal part of his work is highly valuable, full of solid information, and not superseded by any other English publication.

I can never forget the kind assistance I received from this worthy man, when, having always had a passion for plants, I became desirous, at the age of eighteen, of studying botany as a science. The only book I could then procure was "Berkenhout," Hudson's "Flora" having become extremely scarce. I received "Berkenhout" on the 9th of January, 1778, and on the 11th began with infinite delight to examine the *Ulex europæus*, the only plant then in flower. I then first comprehended the nature of systematic arrangement, and the Linnæan principles, little aware that at that instant the world was losing the great genius who was to be my future guide, for Linnæus died in the night of January 11th, 1778.

With "Berkenhout" and a parcel of wild flowers in my hand, I had often recourse to Mr. Rose during the ensuing summer. But alas! in the following year a gutta-serena deprived him of his sight. This affliction, so peculiarly severe to a naturalist, he bore with exemplary patience; for though with the loss of his external visual organ he lost his darling amusement, none could derive more consolation than himself from looking within. During the few

remaining years of Mr. Rose's life, his delight was to assist young people in their classical or botanical studies, and he was always attended by some one or other eager to profit by his conversation.

He had long formed the plan of a popular work on the uses of plants, and though unable to execute his intention altogether himself, he suggested the scheme to Mr. Charles Bryant, brother to the gentleman above-mentioned, an excellent and industrious practical botanist. This was the origin of the "Flora Dietetica" published in 1783. It was dedicated to Mr. Crowe, who had for some years, as well as several other gentlemen of Norwich, embraced with ardour the study of British Botany. The Rev. Mr. Bryant was by this time settled at his living of Heydon, from thence he afterwards removed to Colby in Norfolk, where he died at an advanced age in 1799, having never experienced any diminution of his fondness for botanical pursuits. Mr. Hudson and Mr. Lightfoot were, as long as they lived, his constant correspondents. Mr. Charles Bryant died before his brother.

Mr. Pitchford, therefore, was the only survivor of the original Linnæan School of Norwich. He had been a frequent correspondent of the authors of the "Flora Anglica" and "Flora Scotica." But, though an admirer of Linnæus, he was always peculiarly partial to Ray, and though ever so well acquainted with a plant by its Linnæan name, he would never rest while any obscurity enveloped it in the works of Ray.

The *Carices* and *Menthæ* more particularly engaged Mr. Pitchford's attention; and it must be confessed the study of them on his plan, of scrutinising synonyms without access to any old English herbarium, was not soon to be exhausted. No wonder, therefore, that his conversation and epistolary correspondence on these subjects found no end. Nothing, however, could be more candid and amiable than his discussions. In the last interview I had with him he was particularly strenuous with me to separate the *Mentha hirsuta*, with capitate flowers, from the verticillate *M. sativa*. I think it but just to record the opinion of so indefatigable a practical observer, though my own remains unshaken. As some years have now elapsed since the Linnæan Society published my paper on *Mints*, I take this opportunity of observing, that subsequent experience has strongly confirmed the solidity of the characters taken from the pubescence of the calyx and flower-stalk,

and I find botanists in general can now easily enough make out any *Mint* that comes in their way. On this point, indeed, my late friend was sufficiently disposed to be partial to me, as he always was in every instance in which he could give me credit or do me any service. A few days after the above conversation—

> "he gave
> His blessed part to Heaven and slept in peace.
> So may he rest! His faults lie gently on him!"

I wish the foregoing particulars may afford the Society any entertainment, and am always, dear sir, your faithful friend, and very obedient servant, J. E. SMITH.

Additional remarks by SIR JAMES E. SMITH *to a letter from* MR. JOHN LINDSAY, *Surgeon, Jamaica, on raising some Lycopodium from its farina, and addressed to* SIR JOSEPH BANKS.

Sir J. E. Smith says—"The raising of any species of *Lycopodium* from its farina has not, to my knowledge, been described as practicable, Mr. Lindsay, therefore, has all the merit of an original observer. It is not to detract from his due praise, but to do justice to unostentatious ingenuity, that I now mention Joseph Fox, a journeyman weaver of Norwich, as having made similar experiments upon *Lycopodium selago* with the like success. He showed me in the year 1779, young plants of this species raised from seed in his own garden. This humble observer, whose name has not yet appeared in any book, is the original discoverer of many rare plants in the county of Norfolk, and it is with pleasure I commemorate his former assistance to myself."—*See Linnæan Society's Transactions, Vol. II, page 315. Read 2nd April, 1793.*

IV.

ON MR. MARSHAM'S "INDICATIONS OF SPRING."

By Thomas Southwell, F.Z.S.

Read January 26th, 1875.

The Rev. H. P. Marsham, of Rippon Hall, has kindly placed in my hands the documents from which the "Indications of Spring," communicated to the Royal Society by his great-grandfather, in 1789, were compiled, together with many subsequent years' observations, still unpublished, with permission to make any extracts which I think will be interesting to this Society. Whilst gladly availing myself of Mr. Marsham's kindness, I cannot but express my sincere regret that failing eye-sight has prevented that gentleman from himself giving us an analysis of the journals, which would have been so much more interesting and complete than anything I can hope to lay before you, notwithstanding the help Mr. Marsham has so kindly and readily given me.

The observations were commenced in the year 1736, by Robert Marsham, Esq., F.R.S., at Stratton Strawless Hall, in latitude 52° 45′, about seven miles nearly north of Norwich, and twelve from the sea at the nearest point; for the first few years the observations were not very regular, but about 1745 the entries became more frequent, and from that time are continued with great regularity. In 1789, Mr. Marsham communicated his observations to the Royal Society; they were read on April 2nd, and published *in extenso* in the Philosophical Transactions for that year.* Robert Marsham died in 1797, and the observations were continued by his son, Robert, to the year 1810; he died in 1812. From that time till 1836 no record was kept, but in the latter year, Robert

* A summary of the "Indications" in a tabular form, under the title of "Remarks on Mr. Marsham's Indications of Spring," was published by the first Lord Suffield, and has since been frequently re-produced, with varying degrees of accuracy. I believe Lord Suffield's table was brought down to 1810, but there is no date given.

Marsham, father of the Rev. H. P. Marsham, resumed them. From 1858 to the present time they have been kept at Rippon Hall, about two miles north of Stratton.

The first named Mr. Marsham was an observant naturalist, and exceedingly fond of rural pursuits; the beauty and variety of the trees at Stratton, planted and tended by himself, testify to his skill and taste in arboriculture, and probably suggested the phenomena included in his "Indications," which are just those we can imagine most interesting to a country gentleman spending much of his time upon his own estate, and watching with pleasure the re-awakening to fresh beauty of the trees and plants in which he took such interest.

The first part of the "Journal" kept by Mr. Marsham, and from which the table of "Indications" is compiled, contains, by way of preface, a particular account of the planting which seems to have been systematically commenced by the father of the writer in 1718; in 1736 the regular notes commence, and from that time, to the close of the Journal in 1797, it is replete with the most interesting particulars as to the progress of planting, and the growth and treatment of the trees, with periodic measurements of many of them. This Journal also contains notes of any circumstance which interested the writer; his holiday tours, during which his love for woodcraft constantly shows itself in remarks upon the trees seen by him in the country through which he is travelling, with measurements of some of the most interesting; as well as remarks upon men, things, and passing events, full of interest, and often having appended to them the more mature opinions which the long life of the writer enabled him to form and record. Each year begins by a review of the weather month by month, compiled from notes, and a daily register of the natural history phenomena, interspersed with many valuable observations, and a table of the prevailing winds. It is to this section, from which I shall make frequent extracts, elucidating the results exhibited in the summary before us, that we must confine ourselves. In addition to the phenomena tabulated in the "Indications," there are many others recorded, with more or less regularity, one of which drops out in 1775, and is no more repeated. I refer to the cry of the bittern; it is mentioned, I think, nineteen times between the years 1739 and 1775, so that it does not seem to have been observed with any degree of regularity. The earliest date on which its note was heard was February

20th, 1750, a very early year, the latest, May 3rd, 1772; but in thirteen instances out of the nineteen recorded, it was first heard between the 15th of March and the 15th of April. It is quite possible that the earliest breeding note of this species may not always have been recorded, as it does not seem to have been made a special subject of observation. The average, over a period of seventy years for the nightingale's first song at Stratton, is the 28th of April, and at Rippon, for twenty-three years, April 27th. This is certainly later than the average of its appearing in Norwich, which I should think would be about the middle of the month; sometimes it returns with singular regularity. On the 11th of April, 1754, Mr. Marsham remarks, "Nightingale answered me one note in Stratton, although I did not hear them sing till 26th of themselves." The male nightingale usually arrives about a fortnight before the female.

With regard to the powers of the jay as a mimic, the following occurs April 7th, 1773, "I heard a wind jay in Stratton mimic an owl and kite so well that I thought these birds were singing till I saw the jay." A remark on the 16th of June, 1781, has reference to the curious prolonged note of the nightjar; he says, "I told 1150 whilst a dawhawk sung, and I am confident that + fifty might have been counted before I begun to tell." The singing of the thrush is always noted, and the average given for sixty-six years is January 18th. Thrushes and snowdrops do not seem to be influenced by the weather; should a gleam of sunshine appear, the former will sing, let the weather be ever so wretched, and the latter will bloom, if even under the snow. The months of January and February do not appear to have much effect upon the months which follow, (see 1751 and 1745,) for should March and April be genial, the various phenomena will be early, or in due course, notwithstanding the severity of the preceding months. Dry and cold winds seem to retard vegetation most, and the weather, I am inclined to think, does not effect the movements of the spring emigrants so much as is generally supposed; spring time and autumn repeat themselves in their due course, however adverse the meteorological circumstances may be. The year 1785 is thus described :—"January a wretched month," with "stinking fogs," and yet on the 24th thrushes were singing, and snowdrops blooming. On April 6th, the snow which commenced to fall on the 7th

of the previous December, and had never all disappeared, was still visible, and the water had not been free from ice since the 9th of December, the snow having remained 119, and the ice 117 days continuously, truly "a wretched spring," and yet a glance at the table will show that the spring of 1785 was by no means a late one.

The phenomena observed are twenty-seven in number, and consist of the leafing of the hawthorn, sycamore, birch, elm, mountain ash, oak, beech, horse-chestnut, chestnut, hornbeam, ash, lime, and maple; the flowering of the snowdrop, hawthorn, turnip, and wood-anemone; the commencement of the song of the thrush and ringdove; and the croaking of toads and frogs; the building of the rook, and first appearance of its young ones; the arrivals of the swallow, cuckoo, nightingale, and churn-owl, and the appearance of the yellow butterfly.

For the sake of clearness I have here kept distinct the two sets of observations, those from 1736 to 1810, and those from 1836 to 1874; in the summary at the end they will be treated as continuous. In the first set (1736 to 1810) the earliest years, represented in degree by the figures placed under each, are $\underset{5}{1750}$, $\underset{5}{1794}$, $\underset{4}{1779}$, and $\underset{2}{1736}$; the late years are $\underset{8}{1771}$, (very late,) $\underset{5}{1784}$, $\underset{3}{1799}$, $\underset{2}{1795}$, $\underset{2}{1762}$, $\underset{2}{1770}$, and $\underset{2}{1792}$; in the second set (1836 to 1874) the earliest years were $\underset{6}{1846}$, $\underset{5}{1859}$, $\underset{3}{1849}$, $\underset{3}{1852}$, $\underset{2}{1839}$, and $\underset{2}{1854}$; the late ones, $\underset{6}{1855}$, $\underset{4}{1858}$, $\underset{4}{1861}$, $\underset{3}{1853}$, $\underset{2}{1837}$, and $\underset{2}{1857}$. The figure placed under each year denotes the number of phenomena out of the 27 which occurred earliest or latest in that year, during the 74 years of the first period, or the 38 years of the second; the media for the whole series will be found in the table at the end.

I will now notice the features of some of the most remarkable springs recorded in the Journal, taking the early years first. The year 1750 was a remarkably early one, and I cannot do better than copy it in full from the Journal; it will show how full and careful the observations are, and give a very fair specimen of its style. The year is taken from Christmas to Christmas, and the dates are the old style.

"Christmas Day, 1749, and one day after were frost; and then open to ye end of December.

"1750. *January.* The 4th and 5th of January were frosty; and from ye 10th to ye 17th foggy; all the rest of January uncom-

monly mild and fine weather. Some told me they heard thrushes sing on ye 2nd; but I did not see a snowdrop, till ye 15th, nor hear a thrush 'till ye 17th, and on ye 21st I thought I heard a blackbird; and on ye next day I heard a ringdove coo. The last of January, thunder, with mild showers. From this day, to ye 26th of February, had been ye finest weather I ever felt in this season; and, indeed, from New Year it had been quite open and fine for ye time; yet there had been a good deal of wind in February; 26th, cool, 27th and 28th, some snow.

"*February.* On ye 4th of February I had leaves on my weeping willows; and on ye 9th some saw yellow butterfly, and on ye 13th I saw rooks carry sticks, and hawthorn leaves, and on ye 14th blew violets, and ye elms knop'd in Essex: the 20th was the warmest and finest day I ever felt in February in England; and I heard bitterns and toads sing; and ye 21st I had birch leaves, and ye 22nd sycamore leaves, and turnip flowers, but I was told turnips were in flower in Norfolk on ye 14th, and I saw fair buds of hawthorn May in this month.

"*March.* The whole month of March was surprizing fine, except a little hail on ye 21st, and some sleet on ye 28th and 29th. On ye 2nd (viz., March) I saw blackthorn May, and on ye 13th my spruce firs had some of them broke bud, and on ye 25th I heard a deaf bird, [wryneck] and on ye 30th I heard young rooks; and on ye 31st I saw oak leaves out, in the parish of Stratton.

"*April.* The month of April, tho' not bad, was much less pleasant than March; yet the easterly winds were not constant, and there was snow only upon ye 3rd, and on ye 10th was a tempest. On ye 2nd I heard a mock nightingale, and on ye 8th saw swallows, and ye next day heard a nightingale, and on ye 11th a cuckow, and on ye 13th saw hawthorn May, and on ye 15th beech leaves, and on ye 23rd rye ears. The last week of this month were very dark days.

"*May.* 1st to ye 12th of May cold, N. and E. winds, then to 20th good weather; ye 22nd was frost, and thunder on ye 25th, but from ye 20th cool to ye 30th, but that and ye last day of May fine days, with showers. So on ye whole May was a bad month. On ye 12th I saw clover heads, and on ye 13th mackerell, and on ye 17th heard a dawhawk, and on ye 19th saw pease, and on ye 30th wheat in ear.

"*June.* The first three weeks in June was fine weather, except their being too hot; ye 18th, 19th, and 20th seem'd the hottest days of clear skys that I had felt in England, and yet they were of N. and E. winds; from this to ye last day of ye month was cool, yet there was thunder on ye 26th, but ye 28th was remarkably cold. On ye 10th of this month (June) was a dreadful tempest in ye afternoon and evening, that extended (to my knowledge) near 150 miles at ye same instant, viz., about sunset; for I trac'd it by many persons from Windsor to ye north of Norfolk; on both ye Essex and Newmarket roads; the rain was also great in most of ye way. The 8th I saw oats in ear, and ye 9th barley in ear in Suffolk, and ye 25th buck in flower.

"*July.* July began hot ye first week, but from ye 7th to 22nd were fifteen the hottest days together I ever felt (I believe) in my life, yet there were tempests on ye 11th, 12th, and 16th, and several days showers; 26th a great tempest, with rain and hail; the hail laid some inches deep ye next day; 27th thunder again, and ye 31st more thunder. The only cool day in ye whole month of July was ye 29th.

"*August.* First week of August fine weather, and most days a shower; the rest of ye month generally fine dry weather. I never knew the autumn begin so early. The first harvest I saw was oates on ye 11th of July, and wheat on ye 24th, viz., in Norfolk; and most of ye moderate farmers had ended harvest before August was out, which they had a very fine season for. The brakes, and many oaks, beech, birch, and ash, were turned brown, and some ash and birch quite naked; and all the birch leaves had changed colour. The uncommon dryness of this year had, no doubt, brought on autumn sooner than usuul. Most ponds and standing waters were now dry, and many small streams that us'd to run all sum'r, were also dry, by which the farmers suffer'd great inconvenience, in being forc'd to drive their cattle a great way for water; this was some miles in some parts of Norfolk.

"*September.* The 2nd and 3rd of September were rainy, thence to ye 23rd fine time; ye 10th was very hot, and almost all ye days fine and warm; on ye 14th I saw blew violets, (in Norfolk,) and think they had been in flower almost all ye year in the same garden; from ye 24th to ye end of ye month was mostly drizzle and cool, with N. and easterly wind.

"*October.* And ye whole month of October had not one warm and pleasant day in it, but the last. Yet notwithstanding ye badness and coldness of ye season ye winter birds of passage did not come earlier than usual; for I did not see a feldefer or Danish crow till ye 7th, tho' I saw a woodcock on ye 28th of September, and on ye 14th at Sudbury, and on ye 15th of October, at Milend, I saw swallows. On ye 20th (October) I saw ice, and on ye 24th and 25th snow; ye 26th the ice would bear; from ye 20th to ye 27th inclusive, was sharp frost, and the snow laid a week, that fell on ye 24th. We had hardly any water fell from ye clouds for several months past, that was enough to sink into ye earth, 'till the first snow fell on ye 24th of October, and from thence, thro' that month, and all November, was frequent rains.

"*November.* I have said ye last day of October was a fine day, so were ye 1st, 2nd, and 3rd of November. On ye 18th and 19th was a heavy snow, and on ye 19th sharp frost even within doors, which continu'd ye 20th and 21st: of the snow that fell on the 18th and 19th, some laid on the 26th.

"*December.* December began open, tho' cool. From ye 3rd to ye 16th was dark, but mild weather. On ye 10th I found green buds upon my weeping willows, which were naked by ye last of November, *i. e.*, earlier than I remember before. From ye 16th to 21st mostly frosty; 22nd and 23rd mild.

	S. S.W. & W.	N. & N.W.	E. N.E. & S.E.
December -	6	0	1
January - -	26	2	3
February - -	20	5	0
March - -	18	10	3
April - -	5	10	15
May - -	4	5	22
June - -	13	8	9
July - -	15	6	10
August - -	22	4	3
September -	8	10	12
October - -	4	10	17
November -	8	16	6
December -	15	5	3
	164	91	104

1736 was a very early year; violets were in bloom in December, 1735. Swallows were seen, many of which remained till the 30th of September, and one was seen on the 7th of October. The record of this year is very brief.

1779. *January.* "A severe storm on the 1st, with some snow," then to the end open and mild; 22nd mild, and 23rd mild, like May.

February. "This was the finest February I ever remember; not one flake of snow, and hardly ice, and so mild, the thermometer was sometimes up to 30 of Linnæus,* and so dry, as no rain to be called a shower." *March.* "A continuation of the mild and dry February—much like May for pleasantness." *April.* "First fifteen days clear and fine; the rest cooler, with some showers." *May.* "Alternate periods of dry and showery weather. Wind for the five months—S., S.W. and W., 73 days; N. and N. W., 28 days; N.E., E., and S.E., 50 days."

1794. *January.* "Nearly all frost, with very little snow." *February.* "Kind month, and mild, hardly any snow." *March.* "Uncommonly fine." *April.* "The warmest and finest I remember." *May.* "A dry, cold month, the last half like Christmas."

The springs of the following years were also early beyond the average:—1736, 1747, 1751, 1752, 1775, 1781, 1790, 1800, 1804, 1806, 1809, and 1810.

1751 was a very variable spring. *January*, and to the middle of *February*, was very severe weather. *March* the finest I ever remember, only two days with the wind in an easterly direction; then *April*, very unpleasant, with frosts, and wind in easterly direction for 21 days. *May* fine, and showers.

1757. "July was very hot; 6th, thermometer, 40; 9th, 41; 10th, 46; 11th, 47; 12th, near 46; 13th, near 47; 14th, very near 50.† This, I think, was the hottest day I ever felt in England,

* I cannot find that any thermometric scale was named after Linnæus. Centigrade can hardly be intended, as 30 deg. centigrade would be 86 deg. Farenheit.

† The thermometer here used is probably that of Fowler; it is thus described—"The thermometer has 5 inches divided into 75 degrees above temperate; and 6 inches ⅞ below temperate, divided into 100 deg. The spirit at 80 was about an inch from the bottom." Fowler's 0 = 53½ Farenheit, which would be the temperate spoken of,—34 = + 32 of Far., and + 250 ⅛ boiling point. Near 50 of Fowler would be near 86 Far.

(except y^e famous hot Saturday on y^e 11th of June, 1748, and certainly the hottest days together from y^e 6th inclusive."

Of the severe winters, that of 1739—40 is the most remarkable. The cold commenced on the 5th of November, with snow and frost, which continued a fortnight. On the night of the 25th of December, the very severe season set in, and the ice then formed was not quite gone till the 12th of March following, having continued 79 days, nor did the snow (which fell plentifully in the beginning of January) melt entirely till the frost ended. Many interesting particulars are added in the Journal from other districts. May-day was as cold as Christmas generally is; on the 5th there was snow and ice, and on the 22nd of May a white frost.

1762. *January* was a fine open month. *February*, frost and some snow to the 16th, when the weather became very bad, and snow daily till the 6th of *March*. "This was so great snow that many people perished by it." On the 30th and 31st of March snow, and on the 30th thunder. The first thirteen days of April cool and frosty; thence to the end of the month mostly good weather, but few showers. *May*, the first fourteen days cool, with easterly winds, then seasonable, with showers to the end.

The year 1771 was a very remarkable one, no fewer than eight of the phenomena registered occurring later that spring than any other. I give the extract from the Journal in full:—

"1771. *January*. The first two or three days of the year were mild, then began a severe time; ye 7th Th.* + 4, 8th near 4, 9th ye snow was ten inches deep on the plain; 10th Th. 6 + the snow last night + 7 in., and 15 on ye plain, 11th little snow, N.E. and Th. near 16 below 0, viz., ye lowest i ever saw it, except ye 19th January, 1767, when it was 17. The ice from about five o'clock last evening to nine this morning in my horse pond 2¼ inches thick; ye 12th Th. + 5, 13th and 14th 5, 15th + 6, 16th 6, 17th near 6, 18th near 5, 19th 3. This very severe weather was mostly N.E. Then a week of little snow or frost; 27th little snow and snowdrop F., 28th much snow, S.E., 29th Th. 2. N.B. These marks are below 0.

* Below zero of centrigrade seems here to be intended; the sign + is frequently used to express "more than," See the remark on the prolonged note of the "dawhawk," p. 33.

"*February.* To ye 7th of February moderate snow and frost, ye 7th Th. 1, and ye snow still 2 feet deep in drifts, 8th snow, Th. near 2, 9th Th. 2, 10th snow all day, Th. 3, 11th ditto, Th. 12, 12th little snow, Th. 8, 13th tho' ye wind S.W., Th. + 13, 14th ditto, Th. 11, 15th ditto, Th. + 8, 16th cold thaw, S.E., 18th fair, and i saw a yellow butterfly, 21st Th. 1, yet i heard both thrush and blackbird sing. All hitherto frosty nights and foggy mornings since ye relaxation of ye severe time, 22nd Th. 1 ; 26, v. f. day, ringdoves coo. From ye 3rd of January to ye 17th of February uncommon severe, thence to ye end of February fine, though with often frosty nights and foggy mornings till noon.

"*March.* 1st of March dark and cold, E., 2nd ditto and snow, 3rd v. sharp, E., 4th ditto, N.E., 5th ditto and snow, 6th ditto, N., 7th snow all day, N.E., Th. 1, 8th ditto, N., Th. 1, snow 8 inches deep on ye plain, 9th ditto, Th. near 1, 10th ditto, N.E., Th. 1, 11th frost, Th. + 4, 12th rainy afternoon, snow now a foot deep in drift, 13th thunder, 15th f. rooks build, 20th larch broke bud, 22nd snow, 23rd ditto, Th. 1, 24th ditto, Th. + 4, end of a hawthorn bud greenish, 25th snow all day, Th. 5, 26th ditto, Th. + 4, 27th snow, Th. 2. and every day to ye end of ye month some snow, all with N.E. winds.

"*April.* April continued ye cold, 2nd f. violet, 3rd f. yellow catkins on sallows, 6th v. cold, yet ye frogs sing fairly; this to ye 14th and many nights ice, yet hawthorn and elder l. on ye 11th, and wood anemone f. on ye 13th. On ye 14th i saw snow in a ditch in Felthorp, now 101 days, laying 14 weeks and 3 days. This was ye severest season i have known; cattle were almost starved, bad hay sold for 4s. ye c., and turnips for 5 guineas ye acre, some say per ton. 15th snow almost all day, at least 2 feet deep in ditches in Suffolk, 16th ditto, Cambridgeshire, 18th ye snow laid in Hertfordshire, viz. 105 days—15 weeks, yet i saw a swallow on 18th at Hatfield House; from ye 20th to ye end more moderate, 24th f. wich elm l.

"*May.* 1st and 2nd of May cold, ye 2nd f. horse-chestnut, willow, nut, m. ash, blackthorn and cherry l., 3rd f. turnip F. and nightingale sing, Suffolk, 4th f. sycamore, birch, alder, and crab l., 5th f. cuckow sing, 7th f. hornbeam, maple, and sallow l., 8th f. tulip tree, and March elder l., 9th f. blackthorn F., 10th f. beech, chestnut, and white poplar l., 15th f. oak and cedar l., 16th f. ash

and mackerel, 20th f. churn owl, 22nd f. sp. and sil. fir l., 25th f. hawthorn and lilly valley F., 26th f. horse-chestnut and m. ash F. and acacia and holly l., 27th f. plane l. and lilac F.; the month was generally colder than season, and ye 27th was ye first rain of three weeks.

"*June.* June, too, was colder than usual, with frequent showers: ye 1st holly F., 2nd f. clover F., 7th f. rye ear, (but was told of them on ye 30th of May,) 13th f. peas and strawberrys, 14th f. wheat ear, 15th f. damask rose, 24th f. barley ear.

"*July.* July had very few hot days; some showers, but little heavy rain till ye last day, 2nd f. beech F., 3rd f. oat ear, ye cuckoo sung to ye 8th, 14th Th.* 40, 15th Th. 44, ye 20th lime F., 29th f. harvest peas.

"*August.* August was many showers, and yet the moderate farmers had not bad harvest, mostly cool, 24th and 25th forty-eight hours' rain, 29th Th. 41, and 31st + 42. I suppose from ye coolness and wetness, ye leaves of many trees began to fade in this month.

"*September.* Most of September was cool and rainy; i ended harvest ye 19th; ye 30th i saw an entire rainbow from ye half-moon about midnight, Gunton.

"*October.* First half of October cool and wet; from ye 19th very pleasant to the 3rd of November inclusive; the swallows staid to ye 9th; 14th a plane leaf + 17 inches broad, Stratt.

"*November.* From ye 4th of November to ye middle cool, 6th f. ice, and 8th f. snow, to ye end milder and little rain.

"*December.* December from 2nd to 5th four days' thick fog, then to ye end open, with frosts on ye 29th and 30th. On ye 9th and 11th measured an oriental plane leaf 19 in. broad in Stratt. The wheat-sowing time very favourable, and the season to ye end of December very open, and not cold. The wind as below. This Aut. i had a sycamore leaf a foot broad, and in December an oriental plane l. + 19 inches broad, and ye 11th another leaf full 19 broad.

"During ye severe frost, whilst ye earth was covered deep with snow, i found ye larch trees shed their seeds daily in abundance, which was food for ye seed-eating small birds."

* Possibly centigrade placed in the sun.

WIND IN 1771.

	S. S.W. & W.	N. & N.W.	E. N.E. & S.E.
January - -	5	13	13
February - -	6	6	16
March - -	3	9	19
April - -	5	7	16
May - -	14	2	15
June - -	5	7	18
July - -	12	12	7
August - -	8	18	5
September -	3	5	22
October - -	20	8	3
November -	15	14	1
December -	21	2	8
	117	103	143

1772 was another backward spring. *January* was a very cold and snowy month. *February.* Cold, with frequent snow and frost. *March* was a very cold and uncomfortable month, with frequent and heavy falls of snow. *April* to the 20th often cold rains, and much snow on the 18th, and some on 19th. *May-day* like Christmas, and to 16th easterly winds, with frosty nights. All May very cold. The wind 92 days E., N.E., or S.E., during the five months.

1784. A very severe winter and spring. "*January.* 2nd Thermometer 8; 9th near 7; 11th + 7, viz. 25 Far.; 21st Th. 12 of Lin + 17 of Far. The whole, severest month I have known." *February.* "Except 25th or 26th, all frost and snow." Snow 15 in. deep on 10th. "I found snowdrops flowered under the snow." 19th snow 16 in. deep. *March.* "The most snow I ever knew." 2nd, rooks build, yet many roads impassable in Norfolk, 27th, last three days snow all day, and above a week; Thermometer 4 below frost, and the last day [31st] the old snow remained, and the new 6 in. deep on the plain. *April,* still more snow; "the snow of the 24th of last December laid on the 17th of April at Gunthorpe, viz., 115 days at Bixenhill. I presume this is the severest season felt in England this century." *May* "a seasonable fine month."

1792 shows upon the Summary as a late spring; such, however, was not the case. *February* was a seasonable month, *March* had all weathers, *April* was pleasant and fine, and *May* charming. The two phenomena entered unusually late are the nightingale on 19th of May, and fern owl on 26th of June. There is nothing exceptional about the other records; I therefore conclude these birds were overlooked upon their first arrival.

1795. *January* and *February* very cold, with frost and snow. *March*, on the 7th "the ice remained at Stratton which began on ye 18th of December, viz. 79 days, (the same as in 1740,) we were told . . . by Gunton the snow laid 120 days." *April* and *May* fine. 1799 was a late spring; the diary ceases in 1797, but Whistlecraft's "Climate of England" mentions a remarkable fall of snow in February, and a continued frost, the coldest day of which was February 9th. The years 1755, 1756, 1761, 1767, 1742, 1803, and 1807 were also later than the average. 1745 was a remarkable spring; it opened with the coldest *January* the writer ever remembered, followed by sharp frosts and frequent snow till the 18th of February, when much snow fell till the end of the month, with intense frost. *March* commenced with a continuation of the same weather till the 4th, when the wind changed to the south; the birds commenced singing, and by the 7th most of the snow was gone, the sudden melting causing great floods; by the 20th it was as mild as mid-May, the fine weather continuing till the end of the month. *April* and *May* were equally favourable.

The year 1754 is also worth noting. Mr. Marsham calls it the "three winter year." "This was a terrible severe winter, and very long; snow began on the last of October, and ice on the next day, and on the 26th of November the snow laid on the plains 9 and 10 inches deep, and ye cold continued to ye 12th of December, and on 26th of December ye second winter began, tho' ye snow begun ye next day, and this may be reckoned to ye 9th of February, and on ye 9th of March ye third winter began, (although ye intermediate month was mostly cold and unpleasant,) which lasted to ye end of April inclusive, when, as I said, ye snow continued till ye 10th. Many cattle, horses, and cows, &c., and birds of most sorts perished for want."

I have given these extracts at some length, as independent of their value as records of remarkable seasons, the table of "Indica-

tions" would be much less interesting without them. After Mr. Rt. Marsham's death in 1797, the observations were continued to the year 1810 by his son Robert, but there is no Journal of the weather such as the first Mr. Marsham kept, nor is there any such record with the second set of observations from 1836 to 1874.

It is often said that our "old-fashioned winters" have departed, and that the springs have become later; the "Indications," as they extend over such a lengthened period, and have been kept so nearly in the same spot, offer a good opportunity of testing if such be the case. For this purpose I took the average days of the occurrence of twenty-five of the phenomena mentioned in the "Indications," (omitting two which were not so fully observed as the others,) over the ten years ending 1774, and ascertained the mean of these averages. I then did the same with the ten years ending 1874, and found the mean of the former April the 7th, and of the latter March 29th, showing that the springs are nine days earlier now than one hundred years ago. The calculation in the first period is based upon 196 observations, and in the second 181; and Mr. Marsham tells me the method of observing followed by him is precisely the same as that pursued by his father, grandfather, and great-grandfather. It is not probable, therefore, that the difference is owing to any fault in observing, but is possibly due to drainage or cultivation; upon this point, however, I do not feel that I am sufficiently informed to give an opinion, but shall be glad to hear those of the members present. The soil in the parish of Stratton is for the most part very light and sandy, the subsoil gravel or brick earth. The west end of the parish is heath land, which it pays better to plant than to cultivate. At the commencement of the present century this heath land stretched away to the westward for miles.

Some of the "Indications" are of no scientific value, such as the flowering of the turnip and snowdrop, the commencement of the thrush's song, and appearance of the yellow butterfly, (a hibernating species, which makes a fitful appearance any sunny winter's day,) nor is there much to be learned from a bare date of the arrival of the spring migrants; to be of really scientific value, a much more complete register must be kept, but extending over such a lengthened period, and taken in connection with the more

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comprehensive notes in the "Journal," Mr. Marsham's "Indications" cannot be regarded otherwise than as a most interesting series of records.

In the accompanying table, when the event occurred in more than one year on the earliest or latest date, the respective years are indicated. The last column shows the years in which the event occurred on the medium date.

V.

BIRDS OBSERVED ON THE KIMBERLEY ESTATE SINCE 1847.

By the Earl of Kimberley, V.P.

Read January 26th, 1875.

The following list of birds observed on the estate of Lord Kimberley, near Wymondham and Hingham, has been communicated by his Lordship to the Norfolk and Norwich Naturalists' Society. As a former list appeared in "Land and Water" of October 31st, 1874, comprising only 119 species, Lord Kimberley desires to state that the present list is the result of further inquiry, and a careful revision.

Nearly all the species have been observed by Lord Kimberley himself. Those which he has not himself seen he has admitted on authority which he believes to be thoroughly trustworthy.

1	Eagle	once; probably the Sea Eagle.
2	Osprey	several times; has remained here sometimes for several days.
3	Buzzard	occasionally; but rare of late years.
4	Kite	I have seen once.
5	Peregrine	I have seen once.
6	Hobby	occasionally.
7	Merlin	seen November, 1874.
8	Kestrel	common.
9	Sparrow Hawk	ditto.
10	Long-eared Owl	occasional.
11	Tawny Owl	formerly common, now rare.
12	White Owl	common, since I have prevented the gamekeepers from destroying them.
13	Grey Shrike	seen twice; one killed on my home farm.

14	Red-backed Shrike	occasional; I saw a pair September, 1874.
15	Great Tit	common.
16	Cole Tit	ditto.
17	Blue Tit	ditto.
18	Marsh Tit	ditto.
19	Long-tailed Tit	ditto.
20	Pied Flycatcher	seen once.
21	Spotted Flycatcher	common.
22	Kingfisher	frequent.
23	Raven	used to breed here every year (one pair); now seldom seen. I saw a pair two years ago.
24	Crow	occasional.
25	Hooded Crow	common in winter.
26	Rook	very numerous.
27	Jackdaw	numerous.
28	Magpie	occasional.
29	Jay	common.
30	Nuthatch	ditto.
31	Wryneck	frequent in spring.
32	Creeper	common.
33	Green Woodpecker	common; breed here every year.
34	Great spotted Woodpecker	frequent; breed here.
35	Lesser spotted Woodpecker	rare; seen in 1873 and 1874.
36	Cuckoo	common.
37	Nightjar	occasional.
38	Swift	common — This year, 1874, unusually few, owing, I suppose, to the extraordinary scarcity of insects.
39	Swallow	ditto
40	Martin	ditto
41	Sand Martin	ditto
42	Pied Wagtail	common.
43	Grey Wagtail	number uncertain; less numerous than the pied wagtail.
44	Grey-headed Wagtail	ditto.
45	Yellow Wagtail	ditto.
46	Meadow Pipit	frequent.
47	Tree Pipit	
48	Woodlark	not uncommon.

49	Skylark	very common.
50	Bunting	common.
51	Black-headed Bunting	occasional.
52	Yellow Hammer	common.
53	Snow Bunting	I have seen two or three times.
54	Chaffinch	very common.
55	Tree Sparrow	occasional.
56	Sparrow	abundant.
57	Greenfinch	ditto.
58	Hawfinch	occasional; a pair bred here this spring, 1874.
59	Goldfinch	not many.
60	Siskin	occasional flocks.
61	Linnet	common.
62	Redpole	not uncommon.
63	Brambling	numerous in winter of 1873.
64	Bullfinch	common.
65	Starling	ditto.
66	Dipper	one seen in 1874.*
67	Missel Thrush	common.
68	Fieldfare	ditto.
69	Redwing	ditto.
70	Thrush	ditto.
71	Blackbird	ditto.
72	Ring Ouzel	has been seen several times; one killed near my home farm; a pair nested here seven years ago.
73	Dunnock	common.
74	Redbreast	ditto.
75	Redstart	frequent.
76	Stonechat	occasional.
77	Whinchat	ditto.
78	Wheatear	ditto.
79	Nightingale	common; many breed here.
80	Blackcap	frequent.

* I did not see this bird myself, but after careful inquiry, I feel convinced that the bird reported to me by one of my keepers, who saw it more than once, was a dipper.

81	Garden Warbler	this bird occurs, and also the 'wood warbler,' but as I am seldom at home in spring, I cannot say whether they are common.
82	Whitethroat	common.
83	Lesser Whitethroat	
84	Wood Warbler	
85	Willow Warbler	common.
86	Wren	abundant.
87	Gold Crest	common.
88	Wood Pigeon	ditto.
89	Stock Dove	frequent.
90	Turtle Dove	ditto; many breed here.
91	Pheasant	common.
92	Partridge	ditto.
93	Red-legged Partridge	ditto.
94	Quail	rare; a nest here a few years ago.
95	Golden Plover	occasional flocks.
96	Peewit	flocks in winter; a few breed.
97	Heron	a small heronry here: nine or ten nests usually.
98	Curlew	has been seen, but very rare.
99	Green Sandpiper	occasional.
100	Common Sandpiper	ditto.
101	Woodcock	a few; a nest hatched off in 1872.
102	Great Snipe	two years ago I saw a pair.
103	Common Snipe	a few breed here.
104	Jack Snipe	the numbers of this and the common snipe much diminished by draining.
105	Landrail	occasional; fewer than formerly.
106	Spotted Crake	rare.
107	Water Rail	frequent.
108	Moor Hen	abundant.
109	Coot	occasional.
110	Grey-lag Goose	occasional; but much rarer than formerly.
111	Pink-footed Goose	I have seen one.

112	Egyptian Goose	once or twice.
113	Canada Goose	kept tame; breed freely.
114	Hooper	occasionally, in severe winters; a small flock stayed here till late in spring, two years ago; one was killed.
115	Sheldrake	rare.
116	Shoveller	occasional.
117	Pintail	ditto.
118	Wild Duck	common; many breed here.
119	Teal	not uncommon.
120	Widgeon	ditto.
121	Pochard	common, some winters.
122	Scaup	occasional.
123	Tufted Duck	not uncommon in winter.
124	Gadwall	rare.
125	Golden-eye	not uncommon some winters.
126	Smew	have twice seen small flocks in winter.
127	Goosander	occasional in hard weather; but never an old male bird.
128	Great crested Grebe	a pair have bred regularly for many years on the Semere at Hingham.
129	Dusky Grebe	a pair shot here a few years ago.
130	Dabchick	not uncommon.
131	Cormorant	four or five together twice seen.
132	Common Tern	formerly frequent; now not often seen.
133	Arctic Tern	has been seen occasionally.
134	Lesser Tern	seen a few times.
135	Black Tern	saw a small flock once, and others have been occasionally seen.
136	Black-headed Gull	frequent, as we are only a few miles from Scoulton Mere. [None breed here.]
137	Common Gull	occasional.
138	Kittiwake	seen occasionally in winter.
139	Bearded Tit	formerly not unfrequent; now seldom seen.

VI.

THE WILD CATTLE AT CHILLINGHAM.

By Charles G. Barrett.

Read 23rd February, 1875.

Having lately had an opportunity of visiting the wild cattle at Chillingham Park, with perhaps rather unusual opportunity of observing them closely, I think that a few notes upon their appearance and habits during the winter season, when they are not very often favoured with the attention of visitors, may possibly be of some interest.

My visit was on February 10th, in the the company of a gentleman who is well acquainted with the Earl of Tankerville's agent, and also with the keeper of the cattle, and to this circumstance I owed my good fortune in being allowed to attend at feeding time, instead of being taken to some commanding eminence and shown the beasts through a glass at a safe distance. This latter plan is usually adopted because the animals are as wild and fleet as hares, and will go off with a rush into a distant part of the park at the sight or scent of man, not allowing even the keeper to approach them except at feeding time, and as they have to cross the rivulets at narrow gaps and fords, it sometimes happens that the weaker individuals get injured in the rush. For this reason one principal part of the keeper's duty is to prevent their receiving any kind of fright or disturbance.

In the winter, however, they exhibit a curious modification of habit. The grass of the park being then insufficient for their requirements, they are fed twice a day with a mixture of cut hay and straw, with sometimes a little barley meal, and this is conveyed to the feeding ground in a strong cart. This cart becomes, therefore, a familiar object connected with pleasant associations, and their confidence in it is such that they take no particular notice of any persons who may be with it, provided that they *keep*

close to it. A separation to a very short distance, however, arouses their suspicions at once, and is exceedingly dangerous from their extreme ferocity when irritated.

Arriving at Chillingham about three p.m., I spent some little time in conversation with the keeper, Mr. Michie, a fine old Highlander who has had charge of the cattle for many years, and to whose keen intelligence and shrewd good sense I am indebted for much information (and to his dry humour for much amusement), and at about four p.m. we joined my friend and the agent, and walked across that part of the park which lies close to the castle, and joined the cart which had gone round by an easier road, and which was loaded with large sacks full of fodder.

On surmounting a small eminence, we presently came in sight of the herd in a sheltered spot formed by an angle of the fence of one of the wooded enclosures. The majority were lying down and all evidently waiting the arrival of their food. A little to the left was a semicircle, some hundreds of yards in extent, of large wooden troughs for the reception of the fodder. As we approached, the nearest beasts showed by their wild staring that our presence was regarded with uneasiness, and the attendants advised a closer approach to the cart to divert their dangerous attentions, and as by this time we had reached one end of the semicircle of troughs, the men at once commenced to shake the fodder from the sacks into the troughs, while the keeper, as each was filled, shovelled a small quantity of meal from another sack over the cut hay. The herd were instantly upon their feet, and as soon as we moved forward to the next troughs the more confident animals commenced upon those already filled, licking up the meal with especial eagerness, while the rest crowded behind and moved around us, so that at one moment we were actually surrounded by them at the distance of a few yards. As the cart moved on they fell behind and very soon all were engaged eating the hay and searching out the meal. The more venturesome beasts followed the cart quite closely, particularly two full-grown steers, and some young heifers and calves, and one rather lean-looking calf of about six months old, was always the first to taste of the trough just filled, being stimulated thereto partly by his own fearless disposition, and partly by the gentle hints administered by his older and more powerful companions which pressed behind. Once he came within reach and I attempted

to touch him, but he instantly started back and lowered his head, and the men cried out, "Take care, he'll 'bunch' you" (*i.e.* butt).

When the troughs were all filled we started, following the cart across the semicircle, but walking slowly and looking about we got left some ten yards behind. Our position gave us a fine view of the whole herd scattered along the line of troughs, and mixed with hundreds of fallow deer they had a fine appearance, but suddenly they noticed that we were separated from the cart, and at once the semicircle showed a formidable row of fierce uplifted horns and staring eyes, upon which we rejoined the cart to obviate the immediate danger of a stampede or possibly of an attack. This had the desired effect, and we left them quietly feeding.

At this period of the year the cattle do not show to the greatest advantage, as their hair is exceedingly rough and shaggy as well as much discoloured by dirt, and in some few cases it is rubbed off in large patches, showing the bare skin (a disfigurement ascribed by the keeper to parasitic insects), and I expect that they would look far more beautiful in the shorter glossy coat of the summer, when they would be in fine condition from plenty of grass. They would however, then be very difficult of approach. The colour, when full grown, is in all cases white (a remarkably dirty white at this time of year), but the ears are invariably red and the nose black. Some of the young animals, however (and notably the one already mentioned as so remarkably tame), have a considerable tinge of reddish down the neck and shoulders, more decided, it appeared to me, than they could get by rubbing and rolling in the clay soil. The two youngest calves, however, one a few days old, and the other two months, were beautifully white and very pretty, not larger than a retriever dog. In size the full-grown animals are far inferior to domestic cattle, and do not even equal the black Highland kyloes, although in build and general appearance they approach more nearly to them than to any other breed with which I am acquainted. The bulls, however, are very heavy and powerful in the shoulders, and as they walk with a heavy rolling gait through the herd, shouldering the rest aside as they pass, have a formidable appearance. Such an animal is the "Old Master," as the men called him, recently the king of the herd and apparently but half deposed. He still mixed with the rest, and is evidently very little past his best days. The present king kept away at the further part

of the herd, and we could not examine him so well, but he seemed hardly so well-built a beast as the "Old Master," and had his horns spread wider apart. I was surprised to find much variation in the form and position of these appendages. Some are bent slightly downward, some forward and inward, some straighter and very wide apart, and one ferocious-looking steer, which kept very near to the cart and evidently regarded us with grave suspicion, had them pointing forward and upward in a manner peculiarly suggestive of tossing and impaling any unlucky object of his wrath. This beast was always foremost in any threatening demonstration, and had, it seems, rushed at one of the men a few days before, receiving a lash from a heavy whip, however, which he evidently recollected. As far as I could judge the steers appeared to be the tallest beasts, and the most inclined to take offence. The cows and heifers, which form three-fourths of the herd, are smaller and *looked* more gentle. The full grown bulls, of which there are but two or three, scarcely deigned to notice us.

The whole number of the herd is now sixty-five, and of these one young bull looks very poor and weak. He has probably been injured in a quarrel and it is doubtful whether he will recover, for, as in the case of other wild animals, a sick or wounded beast receives little mercy from his sound companions. A very fine bull of five years old died a few days before our visit from inflammation of the genital organs, caused by injuries received when fighting. Shortly before this an old cow got thrown upon its back in one of the rivulets and was found dead, and one or two full-grown steers have lately been killed for the earl's table. From the necessity of keeping down the number of bulls, which otherwise would be constantly fighting, the keepers are obliged to watch the cows when about to calve, and when the calf has been hidden by its mother in some thicket and covered by her with dead leaves, they take the first opportunity of her absence, feeding with the herd, to examine it and take any measures that may be necessary. The mutilated males, as I before observed, grow into the largest beasts and are shot when required, with the rifle, for the earl's table. The flesh is dark in colour and very full flavoured, with little fat, but the keeper assured me that it loses very little bulk in cooking.

There seems to be no present danger of the extinction of the breed, as the cows continue to be fairly prolific, in spite of constant

in-breeding, but they do not reproduce so frequently as domestic cattle—not much under every two years in fact. The calves suck for a long period, the keepers say from one to two years, but domestic cattle are milked to fully as great an extent, so that this can have little to do with the time of breeding. They have, moreover, no regular breeding season, but the calves are produced at all times of the year, and of those we saw hardly two were of the same age, and one or two must have been calved during the severe weather of the present winter. Whether these peculiarities point to a gradual weakening of the stock from constant in-breeding I am unable to judge.

The ferocity of these animals is easily provoked, particularly if they have suffered any injury. Mr. Hope, the earl's agent, had a narrow escape a few years ago. He was, while with the feeding cart, trying to ascertain what injury had been received by one which appeared lame, when the animal, enraged at his close attention, rushed at and would have gored him but for the fortunate proximity of the fence of one of the young plantations over which he escaped. Two days afterwards he was obliged to shoot it.

The present Earl of Tankerville, when a young man, had a narrow escape. He rode out on a pony to shoot an old bull which had been beaten and driven from the herd, and had become dangerous, when the furious beast, probably irritated by an unsuccessful shot, rushed upon him and killed the pony instantly, ripping it up in a fearful manner. The earl, being nimble, just escaped by climbing a tree, but the brute tore away at its roots with his horns in such a manner that he would soon have torn it up but for the interference of the keepers, who set the dogs at his heels and distracted his attention till they were able by repeated shots to bring him down.

After leaving the cattle we finished our afternoon in a most satisfactory manner by a visit to the castle, and an inspection of Sir Edwin Landseer's magnificent paintings of the "Wild Cattle," "Red Deer," the "Death of the Wild Bull," etc.

VII.

NOTES ON THE METEOROLOGICAL OBSERVATIONS

Recorded at Norwich during the year 1874.

By John Quinton, Jun., Assistant-Secretary.

The year commenced with very fine and unusually mild weather, which lasted until the 4th of February, with a mean temperature for January of 40.0. The winds were chiefly S., S.W., and W. with a mean daily velocity of 198 miles. Considerable barometric oscillation was recorded, the chief variation was a fall from 29.868 at 9 p.m. on the 2nd, to 29.151 at 3 p.m. on the 3rd; succeeded by a quick rise of .280 in. in next six hours, attended by a strong W.S.W. gale from 4.30 to 7.30 p.m. The rainfall, 0.99 in., was .774 below the average; it was the smallest amount for January since 1864. From February the 5th to the 12th, the temperature was very low, only averaging 30.5; the thermometer fell thirteen degrees below freezing on the night of the 5th. The last fortnight was much milder, the mean being 39.7. The days were mostly cloudy, with light variable winds; and a rainfall 3-10ths deficient. The minimum barometric pressure occurred on the 26th (29.156) during a S.E. gale, with a velocity of 350 miles in the twenty-four hours. The mean temperature of March was high, with the exception of the second week, which only averaged 34.7; the last fortnight was especially mild, the mean being 46.5. The day temperatures during the month varied from 37.0 on the 10th, to 64.5 on the 23rd; the night temperatures from 20.0 on the 11th, to 46.5 on the 29th. The barometric pressure averaged high, the maximum for the year, 30.739, was registered on the 6th; a sudden fall was recorded to 29.483 on the 9th, during a N.W. gale, the pressure increased to 30.410 on the 14th, and continued high until the end of the month. A gale from the S.W. and W.S.W. was recorded on the 29th and 30th, when the velocity of the wind was 423 and

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	Range.	Mean Temperature.	Rain.	No. of days on which it fell.	WIND. Direction. N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Mean daily Velocity.
WINTER.		°	In.										Miles.
December, 1873	2	40.3	.43	7	0	0	0	0	6	15	8	2	157
January, 1874	6	40.0	.99	11	1	0	0	1	8	12	7	2	198
February, 1874	1	37.0	1 00	10	2	0	3	5	7	1	7	3	166
Dec. 1873 to Feb. 1874	6	39.1	2.42	28	3	0	3	6	21	28	22	7	174
Four preceding Winters	3	37.5	6.53	39	8	6	12	10	21	14	12	7	189
SPRING													
March, 1874	0	42.3	.64	9	2	0	4	1	1	9	9	5	200
April, 1874	6	48.0	1.17	9	4	0	6	4	6	3	6	1	186
May, 1874	8	48.1	1.09	14	10	5	4	0	0	4	2	6	166
March to May, 1874	1	46.1	2.90	32	16	5	14	5	7	16	17	12	184
Four preceding Springs	3	45.7	4.64	35	14	7	12	8	10	11	14	16	190
SUMMER.													
June, 1874	0	56.0	1.83	10	11	1	5	2	5	4	1	1	163
July, 1874	9	63.7	1.58	8	0	8	7	2	5	5	4	0	143
August, 1874	4	58.4	1.85	10	2	5	0	0	5	8	11	0	179
June to August, 1874	1	59.4	5.26	28	13	14	12	4	15	17	16	1	162
Four predng. Summers	5	60.0	6.10	34	11	5	9	8	12	14	21	12	170
AUTUMN.													
September, 1874	6	57.0	2.36	11	0	1	1	4	10	9	2	3	160
October, 1874	6	51.0	1.99	14	0	1	2	3	13	8	3	1	178
November, 1874	6	41.9	2.30	16	1	0	3	6	2	4	10	4	166
Sept. to Nov., 1874	9	50.0	6.65	41	1	2	6	13	25	21	15	8	168
Four predng. Autumns	5	48.2	7.26	39	7	7	8	7	18	18	17	9	168

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374 miles. The rainfall, only 0.64 in., was the smallest amount recorded for March since 1857, it was .887 deficient. The total fall for the three months, January to March, was only 2.63 in., being two inches below the average, and the least recorded since 1858. The first eighteen days of April were overcast and cloudy, with a mean temperature of 45.7, followed by a very fine week, averaging the unusually high temperature of 57.0, the thermometer registering 74.5 on the 21st. Mr. Glaisher states that this month was the warmest April since 1869, and that only five instances of so high a temperature has been recorded at Greenwich during the last 100 years. A strong S.W. gale was recorded on the 2nd and 3rd, the daily velocity of the wind being 421 and 330 miles, and the barometer fell from 30 inches on the 1st to 29.232 on the 3rd. The barometric pressure again decreased to 29.242 on 13th, followed by a N.N.W. gale on the 14th, when the velocity of the wind was 301 miles. Rain fell on only nine days, and was 3-10ths below the average. From the 1st to the 20th of May the weather was very cold, the mean temperature being only 44.7, the sky generally overcast, winds light from N. and N.W.; the maximum temperature was only 57.0 on the 6th. From the 21st of May to the 11th of June, the days were much warmer, with a mean temperature of 57.2 for the remaining days of May, and 62.0 for the first eleven days of June. A thunder storm occurred on May the 24th; and the rainfall was again deficient by 8-10ths of an inch. The chief barometric variation was a fall from 30.240 on the 20th of May, to 29.476 on the 23rd, followed by a rise to thirty inches on the 26th. On the 11th of June the wind veered to N., and ten cold days with strong N. winds ensued; the maximum temperature on the 12th was only 58.0, and the mean of the ten days 51.7. The wind changed to S. on the 22nd, and the remaining days were milder, but cloudy and showery, and several slight thunder storms were recorded. The rainfall was 1-10th above the average. Considerable variation in the *day* temperatures was recorded during July, the thermometer, which only registered 69.0 on the 1st, rose to 85.0 on the 2nd; on the 7th the maximum was only 69.0, but on the 9th it reached 88.0; on the 16th, 17th, and 18th, it was only 70.2, 71.5, and 70.0; but on the 20th it again reached 86.5. Slight oscillation was recorded in the barometric pressure during June and July, the readings were

generally slightly above the average. The first twenty days of July were very fine and bright; but the remaining eleven days were very cloudy and overcast; a severe thunder storm, with heavy rain, occurred on the 24th, 0.96 in. of rain fell in half-an-hour during the storm; five other thunder storms were recorded. The monthly rainfall was 8-10ths below the average. The first fortnight of August was cold, and the sky generally overcast; the barometer readings averaged about 29.7, 3-10 below the usual pressure, with frequent oscillations, attended by strong W. and S.W. winds. Light N.E. winds prevailed from the 15th to the 25th, with high barometric pressure; but with considerable variation in the day temperatures. The maximum temperatures varied from 64.5 on the 18th, to 80.5 on the 20th, and 63.5 on the 23rd, followed by three unusually cold days. On the 27th the wind changed to S., and the temperature rose to 71.5, the barometer again falling below the average. The rainfall was again deficient, being 4-10ths below the average. From September the 1st to the 19th, the days were cloudy, light S.W. breezes prevailed, frequent showers of rain, and a mean temperature of 56.5. The last eleven days were fine and milder, the mean being 59.5. The chief variation in the barometric pressure was a rise from 29.56 on the 12th to 30.34 on the 14th, followed by a fall to 29.82 on the 17th. The rainfall was .274 in. above the average. October was composed of short periods of alternately cold and mild weather; the mean temperature of the first eight days was 49.0; from the 9th to the 19th, 53.8; 20th to the 24th, only 45.0; and from the 25th to the 31st, 53.0. A thunder storm with heavy rain occurred on the 1st; the rainfall for the first eight days was 1.62 in., but the total fall for the month was 8-10ths below the average. Strong S.W. winds were recorded during the first week; the barometer pressure averaged 29.3 on the first four days, increased suddenly to 30 in. on the 5th, decreased to 29.215 at 10 a.m. the 7th, followed by a rise of .676 in. in next twenty-four hours. Another sudden decrease of pressure was recorded from 30.074 at 9 p.m. the 20th, to 29.393 at 10 a.m. the 21st, attended by a gale from the S.S.W., the velocity of the wind averaged 21 miles an hour from 6 a.m. to 1 p.m. the 21st. The first ten days of November were fine and mild, with a mean temperature of 48.0; the remaining days were very cloudy, with frequent small showers of rain, and much colder;

especially the week ending the 28th, when the mean was only 34.8. Considerable oscillation was recorded in the barometric pressure throughout the month; the most sudden variation was a fall of .811 in. in fifteen hours, from 29.410 at 9 p.m. the 28th, to 28.599 at noon the 29th; this unusually low pressure was followed by a strong S.W. gale from 2 p.m. to midnight on the 29th; 1.01 in. of rain fell on the same day, causing the monthly fall to exceed the average by .056. The year closed with a month of almost unprecedented cold weather; Mr. Glaisher says, that the mean temperature for December was the lowest recorded at Greenwich since 1846, and that only six other instances of so low a mean temperature in December has been recorded in the last hundred years. The mean temperature of the week ending the 5th, and four following weeks were, 36.9, 37.5, 33.7, 28.3, and 22.1; and the mean for the month only 31.9. During the last seventeen days the thermometer did not rise above 38.0, and on the last six not above 32.0. Frosts occurred on twenty-three nights, the minimum on the night of the 29th was twenty-two degrees below freezing; and the maximum on the 31st was nine degrees below. The first fortnight was especially remarkable for the great variation in the barometric pressure; at 10 a.m. the 1st it registered 29.243; increased .847 in. in the next forty-eight hours, decreased to 29.206 on the 6th, followed by a rise to 29.890 at 9 p.m. the 7th, attended by a W.S.W. gale. The following unusual oscillations were also recorded: On the 8th from 29.730 at 10 a.m. to 28.815 at 10 p.m., a fall of .915 in twelve hours; from 28.883 at 10 a.m. the 9th to 29.695 at 10 a.m the 10th, a rise of .812 in twenty-four hours; and from 29.664 at 9 p.m. the 10th, to 28.648 at 9 p.m. the 11th, a fall of 1.016 in twenty-four hours, followed by an unbroken rise to thirty inches on the 15th. The chief gale during this period was from the N.W. on the 9th, when the velocity of the wind was 264 miles in twelve hours. The rainfall for December was .177 in excess of the average; the total fall for the year, 18.95 in., was 4.63 in. deficient.

NOTE.—No barometric observations were taken from the 18th to the 28th of August; the pressure during this period was high, the mean therefore of the observations recorded is below the proper average, probably by about .150 in.

VIII.

MISCELLANEOUS NOTES AND OBSERVATIONS.

MAMMALIA.

BY T. SOUTHWELL.

Arvicola glareolus. In my list of the Norfolk Mammalia, read before this Society in 1871, I was compelled to omit the Red-field, or Bank Vale (*Arvicola glareolus*) for want of positive evidence of its occurrence in this county, although I thought it probable that more careful observation would lead to its discovery, and Mr. Gurney had an impression that a Vole found by him in a Kestrel's nest at Earlham, belonged to this species. Since then its claim to a place in the Norfolk list has been fully established by Mr. F. Norgate, who added to my already great indebtedness to him by kindly sending for my examination the first two specimens taken by him. On the 29th July last, Mr. Norgate obtained in a pitfall at Sparham, an immature specimen which he sent to me, but arriving when I was from home, and having to follow me, it came to hand in such a state as to be utterly indistinguishable; a second, however, taken on the 8th of August, also immature, reached me in capital condition, and proved without doubt to be *Arvicola glareolus*. Since then, Mr. Norgate has taken an old male, on the 13th August, and an old female with five young, on the 20th of the same month. This species differs externally from the common Field Vole (*Arvicola agrestis*) chiefly in its smaller size, longer tail, and the decided rufous tinge of the head and back; it may also be readily distinguished by a dental peculiarity, the molars in the adult being possessed of distinct double roots, which is not the case in either of the other two British Voles. There are also some other anatomical differences. As a British species it was first described by Mr. Yarrell, in a paper read before the Zoological Society of London, on May 22nd, 1832, under the name *Arvicola riparia*. Mr. Yarrell, however, not being aware that it had already been separated by Schreber, there describes it as a species new to science. His paper is valuable for the anatomical comparison between this and the closely allied species *Arvicola agrestis*, which

it contains. This species is said to be widely spread throughout Europe, from the Apennines northward to the Arctic circle; Lord Clermont gives England, France, Belgium, greater part of Germany, Hungary, Denmark, Croatia, and Southern Russia to the Ural mountains, as well as Moldavia, as its habitation. In this country it appears to be generally distributed, according to Bell, though local, extending to the extreme North of Scotland. Mr. Yarrell's specimen was taken in Essex, and we now add Norfolk as a known locality. We have in our Museum part of a jaw and some teeth from the forest-bed which are referred to by Messrs. Blackmore and Alston to this species ("Proceedings of the Zoological Society, 1874," p. 461). Its fossil remains have also been found in several other localities, as Kent's Hole, Hutton Cave, Woolley Hole, &c.

Of its habits I can say nothing from personal observation. Bell says, they are much the same as the common Field Vole, but that it is bolder and more partial to animal food; in confinement it prefers fruits to herbage, a gooseberry being a favourite delicacy. In Morayshire, Mr. Gordon has known them very destructive to young larch by eating the buds and barking the stems in winter. They have been known to plunder the nests of Hedge-sparrows and Robins of their young ones, and to kill and devour a common Shrew.

Common Rorqual (*Balænoptera musculus.* Lin.). On the 1st of March, a fine full-grown female of this species was washed on shore at Happisburgh, on the Norfolk coast. I first saw it on the 2nd, but owing to the rough surf that was breaking upon the beach, and the unfavourable position in which it lay, any close examination was impossible. The head was reversed and partially buried in the sand, so that the blow-holes were not to be seen, the body was then skewed over nearly on its side, the tail portion again having the underpart uppermost; in this position, (the belly being towards me and very much distended, the surf not allowing me to go to the other side), I was unable to see either the dorsal fin or flippers, and upon a subsequent occasion, as will be seen, I was equally unfortunate. At a little distance the baleen was just visible in the partially open mouth, but I could not get near enough, for the reason already stated, to examine it. By dodging the breakers I managed to obtain a rough measurement of the total length, but from the posi-

tion of the whale by no means an exact one. On my second visit a few days after, the whale was a perfect wreck. It was still lying upon its back, had been disembowelled, and of course the important parts were hidden, all the cuticle, which had before been perfect, was worn off by rough usage, some of the ribs were broken and protruding, and the lumbar vertebræ in some places exposed, the lower transverse processes often broken more or less; the smell, owing to the intestines having been removed and floated out to sea (only to be stranded on another part of the coast), was not so offensive as might have been expected, and I succeeded in cutting my way to the baleen, which was hidden by the skin of the throat, the lower jaw being uppermost, the plates were very much mutilated, dark slate colour on the outer edge shaded off to dirty white on the inside. The external appearance, so far as I was able to see it, agreed perfectly with the description in "Bell's British Quadrupeds," second edition, p. 400. The Rev. C. W. Roberts, of Potter Heigham Vicarage, kindly wrote me an account of his visit to the whale, but he was not much more successful than I was. On both occasions I tried to ascertain the total length with different results, neither of which agreed with Mr. Roberts, the bent and twisted position rendering it almost impossible to be exact. I think, however, 70 feet is very near the true length, and the tail measured from the points of the flukes 13 ft. 6 in. I cannot help expressing my regret that this fine specimen should be lost entirely to science.

This species has occurred on the Norfolk coast at Lynn, in August, 1842; Winterton, January, 1857, beside several other earlier instances, and on the Lincolnshire side of the Wash in November, 1858. The smaller species *Balænoptera rostrata* has also occurred several times, viz.: at Runton in 1829; Lynn, January, 1851, and at Overstrand in November, 1860.

Occurrence of Macropis labiata, Panz.

By J. B. Bridgman.

It is with great pleasure I am enabled to record the capture of a splendid male specimen of *Macropis labiata, Panz*, within a few miles of Norwich. It was taken by the Rev. J. L. Brown in one

of his expeditions after insects, for microscopical preparations, but unfortunately he does not know the exact locality. I say unfortunately, because the female has never been taken in this country yet; and this is only the fourth male which has been captured. Mr. F. Smith says, "Of this rare insect only three British collections possess specimens, and these are all males. That in the British Museum was probably the first captured in this country, and was taken by Dr. Leach; the second was met with by Mr. T. Walton in the New Forest, and Mr. Samuel Stephens captured a third at Weybridge, July 4th, 1842. The species is no doubt very rare; not only the precise spot where Mr. Stephens took it, but also the surrounding country have been searched every season since its capture without it again being met with." Mine was taken about the 10th of July, either at Swainsthorpe or Brundall; I have since hunted at Brundall several times, and so has Mr. Brown, without again meeting with it, there remaining now to try the other locality; but even that might be also unsuccessful, as it seems from the above quotation, it is no rule that where one is found others may be, though I do hope I may yet meet with it again, as well as with the female. I have to thank the above gentleman for many other specimens, as he kindly allows me to look over his captures, and take what I want. I only wish I had many more such friends in different parts of the county, as from want of time I have not much chance of collecting far from home.

I should be thankful to entomologists if they would capture any bees, wasps, ants, ruby-tailed flies, or any other insects of this class for me that they may find in their rambles. I am working them up to furnish a list for our Society, and should feel greatly indebted for any assistance either in lists or specimens. I do not care about the insects being set out, that being rather a tedious operation, they can be either killed with cyanide or laurel leaves; but by far the best method is to suffocate them with sulphur, and they might then be put into a bottle or pinned.

Ornithological Notes for 1874—5.

By H. Stevenson, F.L.S.

Early arrival of Nightingales. The song of this bird was first heard on the 4th and 5th of April, in two localities near Norwich, an extremely early date, and several were in song near the city on the 6th, 7th, and 8th. In Mr. Marsham's table of "Indications of Spring," derived from observations extending over a period of ninety-three years, at Stratton Strawless, as published in the present number of the Transactions of this Society, p. 33, under the head of "Nightingale sings," the earliest date is April 7th, 1752, the latest May 19th, 1792, the medium time being April 28th, 1784, a difference of forty-two days observed in ninety-three years.

Heronries in Norfolk. A pair of herons established themselves this year in Keswick Rookery, and brought off their young ones, for the first time since, about forty-five years ago, they quitted that ancient stronghold for Earlham and other neighbouring localities, the underwood there being somewhat thoughtlessly burnt during the breeding season, a liberty which they resented by seeking fresh quarters in the following year. A small and thriving colony of these birds in Lord Suffield's park, at Gunton, near Cromer, was unknown to me when writing my account of this species in "The Birds of Norfolk."

Pied Flycatcher (*Muscicapa atricapilla*). A pair were shot on the 16th of May, in the "North End" gardens at Yarmouth; and about the 25th a fine adult male, at Gunton, near Lowestoft, on the same part of the coast. This species, in small numbers, seems to visit us pretty regularly in spring, and occasionally remains to breed with us, though seldom passing far inland. In my account of the pied flycatcher, in the first volume of "The Birds of Norfolk," I noticed the rarity of its appearance in autumn in the Eastern Counties, but a remarkable immigration of the species occurred at Gunton, near Lowestoft, a very favourite locality, in September, 1868, as recorded by myself in the "Zoologist" for 1869, p. 1492. These seemed to consist of young birds chiefly, but no doubt some adults amongst them in the plain grey plumage they are now ascertained to assume at the close of the breeding season.

SPRING MIGRANTS ON BREYDON. The usual flocks of migratory waders appeared on the Breydon "muds" about the second week in May, and as an evidence that the "Wild Birds' Protection Act" is practically a "dead letter," owing to the absurd alterations made in its penal clauses by the *quasi* friends of the "little bird," I may state that some of the most perfect specimens of knots, sanderlings, bar-tailed godwits, grey plovers, and turnstones, in full summer plumage, that have been killed in this county for some years, were shot on Breydon, beyond the time allowed by the Act, and passed at once into private hands, to the no small annoyance of those collectors who, respecting the Act, notwithstanding its weak points, had not encouraged local gunners to break the law.

RED-NECKED PHALAROPE (*Phalaropus hyperboreus*). This species, which for some years has been a stranger to our coast, occurred this summer in several instances. The Rev. E. W. Dowell informed me that one was shot in June on "Snails Pit," at Swaffham, and on the 4th of July, Mr. Frank Norgate received an adult female, in full summer plumage, which had been caught alive by a boy at Salthouse, but died the same evening. Another was shot in the same neighbourhood about a fortnight later, and one near Lynn in the month of September. This species has not, I believe, occurred here since 1868.

BAILLONS CRAKE (*Crex bailloni*). A very perfect specimen in my own collection, a female in full summer plumage, was picked up dead under the telegraph wires on the Lynn and Hunstanton line, on the 2nd of June, and would probably have nested in that neighbourhood.

EARLY APPEARANCE OF THE FIELDFARE. In my last year's notes, I stated that a fieldfare had been killed by Major Irby, at Boyland, on the 20th of September. This year a single fieldfare was flushed from a turnip field by Mr. Purdy, of Aylsham, on the 1st of September, and two or three were seen by the same gentleman on the 8th.

LATE APPEARANCE OF THE SWIFT, SWALLOW, AND HOUSE MARTIN. Owing, no doubt, to the extreme mildness of the autumn, even to the end of October, a swift was seen by myself and others flying round the steeple of Cromer church on the 14th of October,

an extremely late appearance for this species, and at the same spot a single bird, probably the same, was observed on the 20th. I saw two swallows and some house martins near Norwich, on the 19th of October, and a single house martin was observed at Cromer on the 31st.

FULMAR PETREL (*Procellaria glacialis*). A specimen of this large petrel was shot near Lynn on the 14th of November.

BIRDS KILLED AGAINST THE CROMER LIGHTHOUSE. The following very interesting and extraordinary return of birds, picked up at the foot of the Cromer lighthouse (a revolving light), was supplied to Mr. J. H. Gurney by the keeper, Mr. R. Cowben, and shows how much valuable information, as to the nocturnal migration of birds might be elicited, if "light" keepers, whether ashore or afloat, could be induced to make notes of such occurrences. On the 14th of October, 724 starlings were caught at this light, and on the 15th, 151 larks, one blackbird, and five song thrushes. Some years ago a considerable number of blackbirds were killed against the same lighthouse.

SNIPES AND WOODCOCKS. About the middle of November, and indeed until the severe frost drove them away, our broads and marshes were visited by an immense number of snipes, and in unusually fine condition. On the best snipe grounds I have heard of twenty, thirty, thirty-five, and thirty-seven couples being shot in one day, and the number in our markets told the same tale of plenty. The quantity brought into Yarmouth in December and up to the 8th of January, was greater than had been known for years. Though not a very remarkable season for woodcocks, these birds have occurred in some numbers in places, and stragglers have been found scattered about in unaccustomed localities. At Swanton Wood fourteen, fifteen, and even twenty couples were, I understand, shot in a day, and from nine to ten couples at Hempstead, near Holt, and during the week ending December 30th, a Yarmouth dealer received thirty couples shot in that neighbourhood.

BLACK-THROATED DIVER (*Colymbus arcticus*). Amongst the few birds worthy of special notice that occurred during the severe weather of December, 1874, may be mentioned a very interesting

example of this species which was killed on the 22nd at Horsey Mere, near Yarmouth, the throat showed some indications of the black band of the summer plumage, and the back and wings had the sharply defined black and white bars of the adult summer plumage.

LITTLE BUSTARDS (*Otis tetrax*) IN NORFOLK, ESSEX, AND CORNWALL. On the 2nd of December a specimen of this rare straggler, now in the possession of Captain Bagge, was shot out of a field of coleseed at Tilney St. Lawrence, near Lynn, and was sent to Norwich to be stuffed. It proved to be a female, the eggs about the size of pins-heads, and the stomach contained only a small quantity of vegetable matter. Mr. Hearle Rodd, in the *Field* of January, 2nd, 1875, records another example as shot in a turnip field near the Lizard, Cornwall, about the 21st of December (writing on the 28th he says, "last week"), and in the same paper is a notice of two more killed at Walton-on-the-Naze, of which, through the kindness of a correspondent at Ipswich, I am able to supply the following particulars. They were shot from a field of turnips and cabbages, near Walton-on-the-Naze, by Mr. Eagle, of Walton Hall, who sent them on the 29th of December, in a perfectly fresh state, to a bird-stuffer at Ipswich, and probably, therefore, they were killed on the previous day. Mr. Eagle appears to have shot one in the morning when looking for game, and finding after he reached home that the bird was a rarity, he went back to the same field where he flushed and killed the second. A third is said to have been seen since in the same neighbourhood. The bodies were eaten and are said to have been "exceedingly good," but I do not understand that the sex was determined by dissection. They were, of course, like the others in full winter plumage.* From the appearance of these five birds between the first and last week of December, it seems probable that a small flock alighted somewhere upon our southern coast and from thence became dispersed.

WINTER MIGRANTS IN THE SEVERE FROST OF DECEMBER, 1874. With the first heavy fall of snow, about the 11th, I found the usual traysful of male greenfinches in our fish market, the

* Since this latter date one was shot near Shanklin, in the Isle of Wight, on the 2nd, and another near Looe, Cornwall, on the 9th of January, 1875 as recorded in the "Zoologist," p. 4,339.

only other small birds being male house sparrows, as if they also dissolved partnership when on their travels at this particular season. In all parts of the county the unusually large flocks of redwings and fieldfares excited general notice, and these, as the weather increased in severity, seemed to draw closer to the towns and villages, clearing off the berries of every kind, and exhibiting a tameness during the most severe weather, which I scarcely ever remember to have witnessed before. The deep snow on the 27th, followed by two or three nights of stinging frost, brought them to our doors and windows like robins and sparrows, and in front of my house, on the Unthank's Road, within five yards of the footpath, I counted sixteen fieldfares on one *Pyracanthus* shrub, nailed up between the windows, greedily devouring the berries or resting, in company with a few attendant redwings, on the window-sills or nearest trees so soon as their hunger was appeased for a time. The same thing occurred within the walls of the city as well as in the suburbs, and whilst many fell victims to boys, cats, and other destructives, the survivors left only when no further food was to be had. Why, in their starved condition, they did not pass on southwards before, I cannot quite understand. One thing was particularly observable: the usually wary fieldfares were more starved than the redwings, and exhibited less fear of the passers by. Two fieldfares that I caught and turned into my aviary, died in a wretched state of emaciation, though well supplied with cranberries, whilst a redwing taken at the same time was plump, and still survives. Redwings sitting in rows on the housetops is not a usual sight in Norfolk, and from Yarmouth I learn that an immense flight of redwings was observed just before the very severe weather set in. They came in droves and might have been mistaken for larks from their numbers, and even then many were found dead; the result, possibly, of privation experienced further north. I cannot ascertain that the enormous migration of skylarks said to have been observed on the Lincolnshire coast on the 11th, and in Sussex on the 17th, was remarked in Norfolk, and the Norwich market had but a sprinkling of these birds amongst the number of blackbirds, thrushes, fieldfares, etc., hanging in bunches for sale; but on the 30th, Mr. Gurney informs me, two large flocks of skylarks were observed feeding in some fields at Northrepps, roughly computed at over

five hundred birds; and on the morning of the 17th, I heard of fifteen hundred being netted by one bird-catcher on a farm at Melbourne, near Royston, Cambridgeshire, a distinct flight evidently by the date, from the "millions" seen passing along the Sussex coast on the same day. In our open districts there seems to have been a sensible decrease in the number of blackbirds and song thrushes observed after the first setting in of the sharp weather, most of them, after despoiling the trees and shrubs of their berries, most likely quitting this county for more southern quarters; but a singular circumstance has come to my knowledge, on authority I can scarcely question, respecting these birds in the exposed parts of West Norfolk, about Westacre. The rabbit-catchers employed on that estate, especially on Massingham Heath and Walton Field, where but little shelter is afforded by trees or fences, excused themselves for the small quantity of rabbits taken during the frost and snow, by stating that such numbers of blackbirds and thrushes had sought shelter and died during the inclement weather in the burrows, that the ferrets "laid up" in these well stored larders, and could not be induced to work their usual prey. Bramblings do not appear to have visited us in more than their usual numbers, and snow buntings, so abundant in the mild winter of 1873—4, have appeared only in their ordinary winter flocks on the coast, or a few stragglers inland. Kingfishers have suffered, as they always do in a prolonged frost, and far too many found their way to our bird-stuffers' shops; but amongst the waders I missed in our streets and markets the usual bunches of dunlins exposed for sale, though on Breydon and other waters near the sea, the gunners were active and numerous. On the other hand, I have seldom seen so many golden and green plovers as were brought to our game dealers during the frost, and both on the coast and inland I have heard of considerable flocks seen of both species. How these birds subsisted during the deep snow on our open fields and heaths, I cannot imagine, but there they were; and on the 22nd of December, Mr. Gurney was informed that "innumerable quantities" of both golden and green plovers frequented the fields near the sea at Sherringham. There was a singular dearth of wild fowl in the Norwich market throughout the hard weather, and with the exception of a female merganser and a red-throated diver or two, we had no sea fowl, but I understand that a game-

dealer at Yarmouth sent away some 700 fowl late in December, including a large number of pochards. A few golden-eyes were seen on Breydon, and two females were shot at Earlham, near Norwich, having sought the springs of the inland streams; but although, now-a-days, the chief portion of the fowl killed on our coast is sent direct to London by rail, it is not the first time I have noticed that unusually severe weather setting in *before* Christmas is scarcely so productive of sport to the shore gunners as the sharp frosts of January, and even later dates. I saw no wild swans at this time, but, on the 29th of December, I bought a pink-footed goose, killed at Wroxham, which had been shot on the 23rd, and was told that a larger goose, possibly a bean or a grey-lag, had been sent up with it, this, however, had been purchased and eaten. At Yarmouth some white-fronted geese were obtained, but scarcely any brents, and swans were rare, as well as all "hard-weather fowl," such as goosanders, etc. Of occasional winter visitants there has been a singular absence of siskins, mealy redpoles, waxwings, and hawfinches. A very pretty buff variety of the fieldfare was shot near Norwich during the frost.—(Norwich, March, 1875.)

IX.

FAUNA AND FLORA OF NORFOLK.

Part VI. Flowering Plants and Ferns.

By H. D. Geldart.

Read February 23rd, 1875.

When, nearly six years since, I had the honour of reading to you the first paper presented to this Society on the division of the county into districts for botanical purposes, I did so with the hope of some day bringing before you a List of the Flowering Plants found in the county, showing their distribution throughout those districts.

The first portion of this list, containing the Dicotyledonous Plants, I now present to you, thinking it undesirable to trouble you with the entire list, which would be so large as to require, should it be decided to publish it at once, a Supplement to our Transactions, and would entail unnecessary expense on our Society.

As the four districts into which Norfolk is divided were fully described in the former paper, it is only necessary to summarise them very briefly. If on the map of Norfolk you draw two perpendicular lines, one from Cromer passing through Norwich to a point a little east of Harleston, and the other from Brancaster through Swaffham, to a point a little west of Thetford, and then connect these two lines by a horizontal line joining Swaffham and Norwich, you will have the county divided into four districts, called respectively the eastern, western, northern-central, and southern-central districts, and indicated in the list by the letters e., w., nc., sc.

In using purely arbitrary divisions like these, it must always be impossible to refer the mere record of a plant having been found in a given parish which lies on a boundary line exactly to its right

district, but care has been taken, in compiling this list, to refer any parish to the same district in all cases; thus, "Cromer" and "Norwich" are referred to the eastern, "Brancaster" to the northern-central, and "Swaffham" to the western district; it is probable that a few errors of distribution of this sort have crept in, but it may be fairly hoped they are but few.

It must be remembered that what is here attempted is a summary of records of the occurrence of plants in Norfolk, arranged to show their distribution, and thus to indicate their comparative rarity, and that no attempt is made at the compilation of a "Flora," in the sense of a detailed account of localities; such a work would be quite beyond the space which could be given to it in the Transactions of a Society like this; it is, besides, totally unnecessary—the excellent "Flora of Norfolk," by the Rev. Kirby Trimmer, already occupies the ground, and to it all who require such information may be referred. All notes and mention of localities have been carefully restricted within the narrowest possible compass; only such have been added as appeared actually necessary, either as records of hitherto unpublished localities, or for the sake of confirmation or explanation of entries in the list. Several species are now published for the first time as occurring in Norfolk; for most of these we are indebted to Dr. Lowe, of Lynn, who most kindly sent a List of West Norfolk plants. A few species are placed in brackets, to indicate a doubt as to their having been found in a truly wild state, or as requiring confirmation, and one or two that seemed to rest on insufficient evidence have been omitted altogether. It is to be feared that some of the plants recorded by the earlier Norfolk botanists have become extinct, but the number of those really lost to the county is probably very few, and consists almost entirely of marsh or semi-aquatic species.

Some confusion in the records of the distribution of wild plants in the county has arisen from a practice which prevailed among some of our local botanists of a former generation, who planted or sowed species in which they were particularly interested in their own neighbourhoods. When these species were derived from other localities within the county, no great harm was done; but it is doubtful whether some few species foreign to Norfolk have not been naturalised, and so permanently recorded from this cause: be

this as it may, we may well feel proud of the list of indigenous species which we can show, and which can be vouched by the experience of collectors still living, or the existence of specimens whose habitats are not open to doubt. It is to be regretted that in the difficult genera Rosa, Rubus and Salix, and the sub-genus of Batrachian Ranunculi, for the study of all of which the county affords great opportunities, no local botanists are known to have made themselves specialists of late years; there can be but little doubt of the success which would await anyone having time and leisure to devote to any one of these subjects.

The nomenclature and arrangement used in compiling the list are, as far as possible, those of the Seventh Edition of the "London Catalogue."

I have to thank specially the Rev. E. W. Dowell, and John Lowe, Esq., M.D., for lists of plants occurring in their own districts; the Rev. Kirby Trimmer, for an arrangement and list of the genus Mentha, which he has made his speciality, and which is the only really original portion of the list; and lastly, but by no means leastly, my kind friend, Mr. Hampden G. Glasspoole, for his assistance in the compilation and correction of the entire list.

A LIST OF FLOWERING PLANTS KNOWN TO OCCUR IN NORFOLK.

SECTION I.

DICOTYLEDONOUS PLANTS.

RANUNCULACEÆ.

CLEMATIS VITALBA. Linn.	e.	nc.	sc.	w.
THALICTRUM MINUS. Linn.				
a. maritimum	e.	—	—	—
Caistor Denes, J. W. Ewing, 1837.				
b. montanum	—	nc.	—	w.
Metton, H.D.G. Ringstead, Rev. G. Munford.				
„ MAJUS, Sm.	—	nc.	—	—
Burnham Market. B. G., 1785.				
„ FLAVUM. Linn.	e.	nc.	sc.	w.
ANEMONE PULSATILLA. Linn.	—	nc.	—	—
Sporle and Lexham, B. G.				
„ NEMOROSA. Linn.	e.	nc.	sc.	w.
ADONIS AUTUMNALIS. Linn.	—	nc.	sc.	w.
MYOSURUS MINIMUS. Linn.	e.	nc.	sc.	w.
RANUNCULUS CIRCINNATUS. Sibth.	e.	nc.	sc.	w.
„ FLUITANS. Linn.	—	—	sc.	—
„ PELTATUS. Fries.	e.	—	—	—
b. floribundus	—	—	—	w.
S. Wootton, Dr. Lowe.				
„ DROUETTII. Schultz.	—	—	—	w.
Babingley, Dr. Lowe.				
„ TRICHOPHYLLUS. Chaix	e.	—	—	—
Thorpe, H.D.G.				
„ BAUDOTII. Godron.				
b. confusus	e.	nc.	—	w.
Nth. Wootton, Dr. Lowe.				
„ HEDERACEUS. Linn.	e.	nc.	sc.	w.

RANUNCULUS SCELERATUS. Linn.	e.	nc.	sc.	w.
„ FLAMMULA. Linn.	e.	nc.	sc.	w.
b. pseudo—reptans	—	—	—	w.
Barton Bendish & Fincham, B.G.				
„ LINGUA. Linn.	e.	nc.	sc.	w.
„ AURICOMUS. Linn.	e.	nc.	sc.	w.
„ ACRIS. Linn.	e.	nc.	sc.	w.
„ REPENS. Linn.	e.	nc.	sc.	w.
„ BULBOSUS. Linn.	e.	nc.	sc.	w.
„ HIRSUTUS. Curt.	e.	nc.	sc.	w.
„ PARVIFLORUS. Linn.	e.	nc.	sc.	w.
„ ARVENSIS. Linn.	e.	nc.	—	w.
„ FICARIA. Linn.	e.	nc.	sc.	w.
CALTHA PALUSTRIS. Linn.	e.	nc.	sc.	w.
HELLEBORUS VIRIDIS. Linn.	e.	nc.	—	w.
„ FŒTIDUS. Linn.	e.	nc.	—	w.
AQUILEGIA VULGARIS. Linn.	e.	nc.	—	w.
DELPHINIUM AJACIS. Reich.	e.	nc.	—	w.
ACONITUM NAPELLUS. Linn.	e.	—	—	w.

BERBERACEÆ.

BERBERIS VULGARIS. Linn.	e.	nc.	sc.	w.

NYMPHÆACEÆ.

NYMPHÆA ALBA. Linn.	e.	nc.	—	w.
NUPHAR LUTEA. Sm.	e.	nc.	sc.	w.

PAPAVERACEÆ.

PAPAVER SOMNIFERUM. Linn.	e.	nc.	—	w.
„ RHÆAS. Linn.	e.	nc.	sc.	w.
„ DUBIUM. Linn.	e.	nc.	sc.	w.
„ ARGEMONE. Linn.	e.	nc.	sc.	w.
„ HYBRIDUM. Linn.	e.	nc.	sc.	w.
GLAUCIUM LUTEUM. Scop.	e.	nc.	—	w.
CHELIDONIUM MAJUS. Linn.	e.	nc.	sc.	w.

FUMARIACEÆ.

CORYDALIS LUTEA. D. C.	e.	nc.	sc.	—
„ CLAVICULATA. D. C.	e.	nc.	—	w.

FUMARIA CAPREOLATA. Linn.	e.	nc.	sc.	—
„ OFFICINALIS. Linn.	e.	nc.	sc.	w.
„ DENSIFLORA. D. C.	—	nc.	—	—
"New Burnham, H. and A."				
„ PARVIFLORA. Lam.	e.	—	—	—
In Paget's list.				

CRUCIFERÆ.

CAKILE MARITIMA. Willd.	e.	nc.	—	w.
CRAMBE MARITIMA. Linn.	e.	nc.	—	—
RAPHANUS RAPHANISTRUM. Linn.	e.	nc.	sc.	w.
„ MARITIMUS. Linn.	—	nc.	—	—
SINAPIS ARVENSIS. Linn.	e.	nc.	sc.	w.
„ ALBA. Linn.	e.	nc.	sc.	w.
„ NIGRA. Linn.	e.	nc.	sc.	w.
BRASSICA OLERACEA. Linn.	e.	nc.	sc.	—
„ NAPUS. Linn.	e.	nc.	sc.	w.
„ RUTABAGA. D. C.	e.	nc.	sc.	w.
„ RAPA. Linn.	e.	nc.	sc.	w.
DIPLOTAXIS TENUIFOLIA. D. C.	e.	nc.	—	w.
„ MURALIS. D. C.	e.	—	sc.	w.
SISYMBRIUM, OFFICINALE. Scop.	e.	nc.	sc.	w.
„ SOPHIA. Linn.	e.	nc.	sc.	w.
„ ALLIARIA. Scop.	e.	nc.	sc.	w.
ERYSIMUM CHEIRANTHOIDES. Linn.	e.	nc.	sc.	w.
HESPERIS MATRONALIS. Linn.	—	nc.	sc.	w.
CHEIRANTHUS CHEIRI. Linn.	e.	nc.	sc.	w.
CARDAMINE AMARA. Linn.	e.	nc.	sc.	w.
„ PRATENSIS. Linn.	e.	nc.	sc.	w.
„ HIRSUTA. Linn.	e.	nc.	sc.	w.
ARABIS THALIANA. Linn.	e.	nc.	sc.	w.
„ HIRSUTA. Brown.	e.	nc.	sc.	w.
BARBAREA VULGARIS. Brown.	e.	nc.	sc.	w.
„ PRÆCOX. Brown.	e.	—	—	—
So recorded in Munford's list.				
NASTURTIUM OFFICINALE. Brown.	e.	nc.	sc.	w.
„ SYLVESTRE. Brown.	e.	nc.	sc.	w.
„ PALUSTRE. D. C.	e.	—	—	w.
„ AMPHIBIUM. Brown.	e.	nc.	sc.	w.

ARMORACIA RUSTICANA. Bab. . . . . e. nc. sc. w.
COCHLEARIA OFFICINALIS. Linn. . . . . e. nc. — w.
„ DANICA. Linn. . . . . e. nc. — w.
Paget's List. Wells, E. F.
Holme. Dr. Lowe.
„ ANGLICA. Linn. . . . . e. — — w.
Paget's List. Lynn, 1781.
Herb. Sm.
DRABA VERNA. Linn. . . . . e. nc. sc. w.
„ MURALIS. Linn. . . . . — — — w.
Gaywood, Dr. Lowe.
ALYSSUM CALYCINUM. Linn. . . . . e. nc. — w.
Ormesby, Mr. H. G. Glasspoole.
Marham, Mr. Bray.
Middle Level Drain, Dr. Lowe.
„ MARITIMUM. Lam. . . . . e. nc. — —
CAMELINA SATIVA. Crantz. . . . . e. nc. sc. —
THLASPI ARVENSE. Linn. . . . . e. nc. sc. w.
IBERIS AMARA. Linn. . . . . — — — w.
E. Winch, New Bot. Guide.
TEESDALIA NUDICAULIS. Brown. . . . . e. nc. sc. w.
CAPSELLA BURSA-PASTORIS. Mœnch. . . e. nc. sc. w.
LEPIDIUM LATIFOLIUM. Linn. . . . . e. nc. — w.
„ RUDERALE. Linn. . . . . e. nc. — w.
„ CAMPESTRE. Brown. . . . . e. nc. — w.
„ SMITHII. Hook. . . . . e. nc. sc. w.
„ DRABA. Linn. . . . . — — — w.
Ashwicken, Mr. Bray, Dr. Lowe.
SENEBIERA DIDYMA. Pers. . . . . — — — w.
Lynn, Dr. Lowe.
„ CORONOPUS. Poir. . . . . e. nc. sc. w.
ISATIS TINCTORIA. Linn. . . . . — — — w.
Barton Bendish, Bot. Guide.
"I doubt if this grows now in West Norfolk."
Dr. Lowe.

RESEDACEÆ.

RESEDA LUTEA. Linn. . . . . e. nc. sc. w.
„ LUTEOLA. Linn. . . . . e. nc. sc. w.

Cistaceæ.

Helianthemum vulgare. Gaert. . . . . e. nc. sc. w.

Violaceæ.

Viola palustris. Linn. . . . . e. — nc. w.
„ odorata. Linn. . . . . e. nc. sc. w.
b. alba . . . . . e. — — —
Buxton, Miss Wright.
„ hirta. Linn. . . . . — — — w.
Fincham, Rev. W. Blyth, Dr. Lowe.
„ sylvatica. Fries. . . . . e. nc. sc. w.
„ flavicornis. Sm. . . . . e. — — w.
„ lactea. Sm. . . . . e. — — —
In Paget's List, "North Denes."
„ tricolor. Linn. . . . . e. nc. sc. w.
b. arvensis . . . . . e. nc. sc. w.

Droseraceæ.

Drosera rotundifolia. Linn. . . . . e. nc. sc. w.
„ anglica. Huds. . . . . e. nc. sc. w.
„ intermedia. Hayne. . . . . e. nc. sc. w.

Polygalaceæ.

Polygala vulgaris. Linn. . . . . e. nc. sc. w.
„ depressa. Wender. . . . . — nc. — —
Runton, H.D.G.

Frankeniaceæ.

Frankenia lævis. Linn. . . . . e. nc. — w.
Yarmouth, G. Fitt.
Cley, W. Whitear.
Holme Marsh, Dr. Lowe.

Caryophyllaceæ.

Dianthus armeria. Linn. . . . . e. — sc. w.
„ deltoides. Linn. . . . . — nc. — w.
Grimstone, Rev. E. W. Dowell.
Southacre, Dr. Lowe.
„ prolifer. Linn. . . . . e. nc. — w.

SAPONARIA OFFICINALIS. Linn. . . . . e. nc. sc. w.
SILENE INFLATA. Sm. . . . . e. nc. — w.
„ MARITIMA. With. . . . . e. nc. — w.
„ CONICA. Linn. . . . . — nc. — w.
Very plentiful between Cromer and Runton.—H. D. G.
West Newton and Hunstanton.—Dr. Lowe.
„ ANGLICA. Linn. . . . . e. nc. sc. w.
„ OTITES. Sm. . . . . — — sc. w.
Narborough, Mr. B. Wardale.
Hillborough, Rev. E. W. Dowell.
Thetford, Rev. W. Blyth, Dr. Lowe.
„ NOCTIFLORA. Linn. . . . . e. nc. sc. w.
LYCHNIS VESPERTINA. Sibth. . . . . e. nc. sc. w.
„ DIURNA. Sibth. . . . . e. nc. sc. w.
„ FLOS-CUCULI. Linn. . . . . e. nc. sc. w.
„ GITHAGO. Lam. . . . . e. nc. sc. w.
HOLOSTEUM UMBELLATUM. Linn. . . . . e. — sc. —
Yarmouth, B. Fl.
Norwich, in several localities, still remaining, I believe, in one of them. And recorded as "sc." in Munford's List in White's Norfolk.
MÆNCHIA ERECTA. Sm. . . . . e. nc. — w.
CERASTIUM TETRANDRUM. Curt. . . . . e. — — w.
South Denes, Paget.
Bawsey, Hunstanton, and Rising, Dr. Lowe.
„ SEMIDECANDRUM. Linn. . . . . e. nc. sc. w.
„ GLOMERATUM. Thuill. . . . . e. nc. sc. w.
„ TRIVIALE. Link. . . . . e. nc. sc. w.
„ ARVENSE. Linn. . . . . e. nc. sc. w.
STELLARIA AQUATICA. Scop. . . . . — nc. sc. w.
Earlham, Mr. Wigham.
Ashwicken and Stoke Ferry, Dr. Lowe.
And recorded in "nc." in Rev. K. Trimmer's Flora.

STELLARIA MEDIA. With.	e.	nc.	sc.	w.
„ HOLOSTEA. Linn.	e.	nc.	sc.	w.
„ GLAUCA. With.	e.	nc.	—	w.
„ GRAMINEA. Linn.	e.	nc.	sc.	w.
„ ULIGINOSA. Murr.	e.	nc.	sc.	w.
ARENARIA TRINERVIS. Linn.	e.	nc.	sc.	w.
„ SERPYLLIFOLIA. Linn.	e.	nc.	sc.	w.
b. leptoclados	—	—	—	w.

Abundant at West Newton and Hunstanton, found by Professor Babington, Dr. Lowe.

HONCKENEYA PEPLOIDES. Ehrh.	e.	nc.	—	w.
ALSINE TENUIFOLIA. Crantz.	e.	nc.	—	w.
SAGINA MARITIMA. Don.	e.	nc.	—	w.
„ APETALA. Linn.	e.	nc.	sc.	w.
„ PROCUMBENS. Linn.	e.	nc.	sc.	w.
„ SUBULATA. Wimm.	e.	nc.	—	w.

Is recorded for these districts in Rev. K. Trimmer's Flora.

„ NODOSA. Meyer.	e.	nc.	sc.	w.
SPERGULA ARVENSIS. Linn.	e.	nc.	sc.	w.
SPERGULARIA RUBRA. Fenzl.	e.	nc.	sc.	w.
„ NEGLECTA. Syme.	—	—	—	w.

West Lynn, Dr. Lowe.

ILLECEBRACEÆ.

HERNIARIA GLABRA. Linn.	—	—	sc.	w.

Recorded for these two districts in Munford's List. I have no localities beyond West Norfolk. —H. D. G.

SCLERANTHUS ANNUUS. Linn.	e.	nc.	sc.	w.
„ PERENNIS. Linn.	e.	nc.	sc.	w.

PORTULACACEÆ.

MONTIA FONTANA. Linn.	e.	nc.	sc.	w.
CLAYTONIA PERFOLIATA. Don.	—	—	—	w.

Wolferton, Dr. Lowe.

HYPERICACEÆ.

HYPERICUM ANDROSÆMUM. Linn.	e. nc. — w.	
,, CALYCINUM. Linn.	e. nc. — w.	
Woodton—escaped. Mr. G. Cooper, Mr. H. G. Glasspoole.		
,, PERFORATUM. Linn.	e. nc. sc. w.	
,, DUBIUM. Leers.	— nc. sc. w.	
,, TETRAPTERUM. Fries.	e. nc. sc. w.	
,, HUMIFUSUM. Linn.	e. nc. sc. w.	
,, PULCHRUM. Linn.	e. nc. sc. w.	
,, HIRSUTUM. Linn.	e. nc. sc. —	
,, MONTANUM. Linn.	e. — sc. —	
Between Norwich and Thorpe. Tuck's Wood, Mr. Wigham.		
,, ELODES. Linn.	e. nc. sc. w.	

MALVACEÆ.

ALTHÆA OFFICINALIS. Linn.	e. nc. — w.
MALVA MOSCHATA. Linn.	e. nc. — w.
,, SYLVESTRIS. Linn.	e. nc. sc. w.
,, ROTUNDIFOLIA. Linn.	e. nc. sc. w.

TILIACEÆ.

TILIA EUROPŒA.	e. nc. sc. w.
,, PARVIFOLIA. Ehrh.	e. — — —
,, GRANDIFOLIA. Ehrh.	e. nc. sc. —
In the absence of further information, I am obliged to repeat Mr. Munford's distribution of this genus.—H. D. G.	

LINACEÆ.

RADIOLA MILLEGRANA. Sm.	e. nc. sc. w.
LINUM CATHARTICUM, Linn.	e. nc. sc. w.
,, PERENNE. Linn.	e. nc. — w.
,, ANGUSTIFOLIUM. Huds.	e. nc. — w.
Walsingham and Gunton, E. Flora. Hunstanton, Dr. Lowe.	
,, USITATISSIMUM. Linn.	— nc. — w.

GERANIACEÆ.

GERANIUM SANGUINEUM. Linn.	—	—	—	w.
Recorded for this district in Rev. K. Trimmer's Flora.				
„ SYLVATICUM. Linn.	e.	—	—	w.
„ PRATENSE. Linn.	—	—	sc.	—
In Rev. K. Trimmer's Flora.				
„ PYRENAICUM. Linn.	—	—	sc.	w.
Wereham, Dr. Lowe.				
„ MOLLE. Linn.	e.	nc.	sc.	w.
„ PUSILLUM. Linn.	e.	nc.	—	w.
West Newton, Dr. Lowe.				
„ DISSECTUM. Linn.	e.	nc.	—	w.
„ COLUMBINUM. Linn.	e.	nc.	sc.	w.
„ LUCIDUM. Linn.	e.	nc.	sc.	w.
„ ROBERTIANUM. Linn.	e.	nc.	sc.	w.
ERODIUM CICUTARIUM. Herit.	e.	nc.	sc.	w.
„ (MOSCHATUM. Herit.)	—	nc.	—	—
Cromer, B. G.				
I have spent much time searching for this plant in the neighbourhood of Cromer without success, and I much doubt if it ever occurred there, except as an escape from a garden.—H. D. G.				
„ MARITIMUM. Sm.	e.	nc.	—	—
OXALIS ACETOSELLA. Linn.	e.	nc.	sc.	w.
(IMPATIENS NOLI-ME-TANGERE. Linn.)	—	—	sc.	—
Besthorpe. "In making the garden at Besthorpe Vicarage, I broke up an old pasture that had not been disturbed for several hundred years, so far as I could ascertain. The Balsam came up in abundance, but died out in four or five years, doubtless aided by the hoe."—Rev. E. W. Dowell.				

ILICACEÆ.

ILEX AQUIFOLIUM. Linn. . . . . e. nc. — w.

CELASTRACEÆ.

EUONYMUS EUROPŒUS Linn. . . . . e. nc. sc. w.

RHAMNACEÆ.

RHAMNUS CATHARTICUS. Linn. . . . . e. nc. sc. w.
„ FRANGULA. Linn. . . . . e. nc. sc. w.

SAPINDACEÆ.

ACER PSEUDO-PLATANUS. Linn. . . . . e. nc. sc. w.
„ CAMPESTRE. Linn. . . . . e. nc. sc. w.

LEGUMINIFERÆ.

ULEX EUROPŒUS. Linn. . . . . e. nc. sc. w.
„ NANUS. Forster. . . . . e. nc. — w.
GENISTA ANGLICA. Linn. . . . . e. nc. — w.
„ TINCTORIA. Linn. . . . . e. — sc. w.
SAROTHAMNUS SCOPARIUS. Koch. . . . . e. nc. sc. w.
ONONIS ARVENSIS. Auct. . . . . e. nc. sc. w.
ANTHYLLIS VULNERARIA. Linn. . . . . e. nc. — w.
MEDICAGO SATIVA. Linn. . . . . e. nc. sc. w.
„ SYLVESTRIS. Fries. . . . . e. nc. — —

Is thus recorded in Manford's List. I have found it several times at Cromer.—H.D.G.

„ FALCATA. Linn. . . . . e. nc. sc. w.

Not uncommon near Norwich, in the three first districts. Stoke Ferry, Westacre, Narboro'.—Dr. Lowe.

„ LUPULINA. Linn. . . . . e. nc. sc. w.
„ DENTICULATA. Willd. . . . . e. nc. — —
„ MACULATA. Sibth. . . . . e. nc. — w.
„ MINIMA. Lam. . . . . — — — w.

Roydon Common, 1865, Dr. Lowe.

MELILOTUS OFFICINALIS. Willd. . . . . e. — sc. w.
„ ALBA. Lam. . . . . e. nc. sc. w.

MELILOTUS ARVENSIS. Wallr. . . . . — nc. sc. —
Between Cromer and Runton.—
H. D. G.
Thetford, Brit. Flora.
TRIGONELLA ORNITHOPODIOIDES. D. C. . . e. nc. sc. w.
TRIFOLIUM SUBTERRANEUM. Linn. . . . e. nc. — w.
„ PRATENSE. Linn. . . . . e. nc. sc. w.
„ MEDIUM. Linn. . . . . e. nc. sc. —
„ OCHROLEUCUM. Linn. . . . . e. nc. sc. w.
„ MARITIMUM. Huds. . . . . e. nc. — w.
„ INCARNATUM. Linn. . . . . — — — w.
Middleton, Dr. Lowe.
„ ARVENSE. Linn. . . . e. nc. — w.
„ STRIATUM. Linn. . . . . e. nc. sc. w.
Roydon Common, Dr. Lowe.
„ SCABRUM. Linn. . . . . e. nc. sc. w.
„ GLOMERATUM. Linn. . . . . e. nc. sc. w.
„ SUFFOCATUM. Linn. . . . . e. nc. — —
„ REPENS. Linn. . . . . e. nc. sc. w.
„ FRAGIFERUM. Linn. . . . . e. nc. sc. w.
„ PROCUMBENS. Linn. . . . . e. nc. sc. w.
„ MINUS. Relhan. . . . . e. nc. sc. w.
„ FILIFORME. Linn. . . . . e. nc. sc. w.
LOTUS CORNICULATUS. . . . . e. nc. sc. w.
„ TENUIS. Kit. . . . . e. nc. sc. w.
W. Lynn, 1867, Dr. Lowe.
„ MAJOR. Scop. . . . . e. nc. sc. w.
ASTRAGALUS HYPOGLOTTIS. Linn. . . . . — — — w.
Fincham, Rev. W. Blyth, Dr. Lowe.
„ GLYCYPHYLLUS. Linn. . . . . — — sc. w.
Shouldham, Roydon near Diss, Bot. Guide.
ORNITHOPUS PERPUSILLUS. Linn. . . . . e. nc. sc. w.
HIPPOCREPIS COMOSA. Linn. . . . . e. — sc. w.
Recorded in "e." by Rev. K. Trimmer.
West Newton, Dr. Lowe.
ONOBRYCHIS SATIVA. Lam. . . . . e. nc. — w.

VICIA HIRSUTA. Koch.	e.	nc.	sc.	w.
,, TETRASPERINA. Mœnch.	e.	nc.	—	w.
,, CRACCA. Linn.	e.	nc.	sc.	w.
,, SEPIUM. Linn.	e.	nc.	sc.	w.
,, SATIVA. Linn.	e.	nc.	sc.	w.
,, ANGUSTIFOLIA. Roth.	e.	nc.	sc.	w.
b. Bobartii. Forst.	e.	—	—	—
Cromer, very plentiful in 1863; nearly destroyed in 1864 by a large fall of cliff.—H. D. G.				
,, LATHYROIDES. Linn.	e.	nc.	sc.	w.
LATHYRUS APHACA. Linn.	e.	—	sc.	—
Seething, R. Wigham.				
Brooke and Forncett, Eng. Flora.				
,, NISSOLIA. Linn.	—	nc.	sc.	w.
,, PRATENSIS. Linn.	e.	nc.	sc.	w.
,, SYLVESTRIS. Linn.	e.	—	—	w.
Brundall, Eng. Fl.				
Reffley, Dr. Lowe.				
,, PALUSTRIS. Linn.	e.	—	—	w.
Horning, H. D. G.				
N. Wootton, Dr. Lowe.				
OROBUS TUBEROSUS. Linn.	—	—	—	w.
So recorded in Mr. Munford's List. I found a specimen of it amongst some plants said to have been gathered at Horning, but dare not record it on such evidence. —H. D. G.				

ROSACEÆ.

PRIMUS SPINOSA. Linn.	e.	nc.	sc.	w.
,, INSITITIA. Linn.	e.	nc.	—	w.
,, DOMESTICA. Linn.	e.	nc.	—	—
,, AVIUM. Linn.	e.	nc.	—	—
,, CERASUS. Linn.	e.	nc.	sc.	w.
,, PADUS. Linn.	e.	nc.	sc.	w.
SPIRÆA ULMARIA. Linn.	e.	nc.	sc.	w.
,, FILIPENDULA. Linn.	—	nc.	sc.	w.

AGRIMONIA EUPATORIA. Linn. . . . . e. nc. sc. w.
SANGUISORBA OFFICINALIS. Linn. . . . . — nc. — —
So recorded by Rev. K. Trimmer.
POTERIUM SANGUISORBA. Linn. . . . . e. nc. — w.
ALCHEMILLA ARVENSIS. Scop. . . . . e. nc. sc. w.
„ VULGARIS. Linn. . . . . — — — w.
Roydon, Mr. Bray, Dr. Lowe.
POTENTILLA FRAGARIASTRUM. Ehr. . . . . e. nc. sc. w.
„ TORMENTILLA. Schenk. . . . . e. nc. sc. w.
„ PROCUMBENS. Sib. . . . . e. — — —
Is thus recorded in Rev. G. Munford's List.
„ REPTANS. Linn. . . . . e. nc. sc. w.
„ ANSERINA. Linn. . . . . e. nc. sc. w.
„ ARGENTEA. Linn. . . . . e. nc. sc. w.
COMARUM PALUSTRE. Linn. . . . . e. nc. sc. w.
FRAGARIA VESCA. Linn. . . . . e. nc. sc. w.
„ ELATIOR. Ehr. . . . . e. — sc. —
*RUBUS IDÆUS. Linn. . . . . e. nc. sc. w.
„ SUBERECTUS. Anders. . . . . e. nc. — w.
„ LINDLEIANUS. Lees. . . . . — — — w.
(R. Nitidus. Bell Salter.) Wolferton.
Dersingham, Dr. Lowe.
„ RHAMNIFOLIUS. W. & N. . . . e. nc. sc. —
So recorded by Rev. Kirby Trimmer
„ DISCOLOR. W. & N. . . . . e. nc. sc. w.
„ LEUCOSTACHYS. Sm. . . . . — — — w.
Rev. G. Munford's List.
„ CARPINIFOLIUS. W. & N. . . . e. nc. — w.
Recorded by Rev. Kirby Trimmer.

* Mr. Hampden G. Glasspoole sends me the following note—List of Rubi found in Norfolk, from Babington's work on the subject :—

R. RHAMNIFOLIUS . . . . . Lynn.
R. DISCOLOR . . . . . Fakenham.
R. HYSTRIX . . . . . Cromer.
R. KOEHLERI g. PALLIDUS . . . Fakenham.
R. CORYLIFOLIUS a. SUBLUSTRIS . . Ditto.
R. „ PURPUREUS . . Ditto.
R. TUBERCULATUS . . . . . Hunstanton.

RUBUS KOEHLERI. Weihe.	—	nc.	sc.	—
Rev. G. Munford's and Mr. S. P. Woodward's Lists.				
„ CORYLIFOLIUS Sm.	e.	nc.	sc.	w.
„ CÆSIUS. Linn.	e.	nc.	sc.	w.
GEUM URBANUM. Linn.	e.	nc.	sc.	w.
„ INTERMEDIUM. Ehrh.	—	—	—	w.
Wolferton Wood, Dr. Lowe.				
„ RIVALE. Linn.	e.	nc.	sc.	w.
ROSA SPINOSISSIMA. Linn.	e.	nc.	sc.	—
„ TOMENTOSA. Sm.	e.	nc.	sc.	w.
„ RUBIGINOSA. Linn.	e.	—	sc.	w.
„ CANINA. Linn.	e.	nc.	sc.	w.
„ SYSTYLA. Woods.	e.	nc.	sc.	w.
„ ARVENSIS Huds.	e.	nc.	sc.	w.
MESPILUS GERMANICA. Linn.	—	—	sc.	—
Tuck's Wood, Dr. Mann.				
CRATŒGUS OXYACANTHA. Linn.	e.	nc.	sc.	w.
PYRUS TORMINALIS. Ehrh.	e.	—	sc.	—
Lakenham, S. P. Woodward.				
„ ARIA. Hooker.	e.	nc.	sc.	—
„ AUCUPARIA. Gœrt.	e.	nc.	sc.	—
„ COMMUNIS. Linn.	e.	nc.	sc.	w.
„ MALUS. Linn.	e.	nc.	—	w.

LYTHRACEÆ.

LYTHRUM SALICARIA. Linn.	e.	nc.	sc.	w.
PEPLIS PORTULA. Linn.	e.	nc.	sc.	w.

ONAGRACEÆ.

EPILOBIUM ANGUSTIFOLIUM. Linn.	e.	nc.	—	—
So recorded by Rev. Kirby Trimmer.				
b. brachycarpum	—	—	—	w.
Bawsey, Dr. Lowe.				
„ HIRSUTUM. Linn.	e.	nc.	sc.	w.
„ PARVIFLORUM. Schreb.	e.	nc.	sc.	w.
„ MONTANUM. Linn.	e.	nc.	sc.	w.
„ TETRAGONUM. Linn.	e.	nc.	—	w.

EPILOBIUM PALUSTRE. Linn.	e.	nc.	—	w.
ŒNOTHERA BIENNIS. Linn.	e.	—	—	—
CIRCÆA LUTETIANA. Linn.	e.	nc.	sc.	w.

HALORAGIACEÆ.

MYRIOPHYLLUM VERTICILLATUM. Linn.	e.	nc.	sc.	w.
„ SPICATUM. Linn.	e.	nc.	—	w.
HIPPURIS VULGARIS. Linn.	e.	nc.	sc.	w.
CALLITRICHE VERNA. Linn.	e.	nc.	sc.	w.
„ PLATYCARPA	e.	nc.	sc.	w.
Roydon, Dersingham, N. Wootton, Dr. Lowe.				
„ AUTUMNALIS. Linn.	—	—	—	w.
In Rev. G. Munford's List.				

CUCURBITACEÆ.

BRYONIA DIOICA. Linn.	e.	nc.	sc.	w.

GROSSULARIACEÆ.

RIBES GROSSULARIA. Linn.	e.	nc.	sc.	w.
„ RUBRUM. Linn.	e.	nc.	—	w.
„ NIGRUM. Linn.	e.	nc.	sc.	w.

CRASSULACEÆ.

TILLÆA MUSCOSA. Linn.	e.	nc.	sc.	w.
SEDUM TELEPHIUM. Linn.	e.	nc.	sc.	w.
„ ALBUM. Linn.	—	nc.	—	—
Dereham, S. P. Woodward, Burnham, New Bot. Guide.				
„ ANGLICUM. Huds.	e.	nc.	—	—
„ ACRE. Linn.	e.	nc.	sc.	w.
„ REFLEXUM. Linn.	e.	nc.	—	w.
„ RUPESTRE. Huds.	e.	—	—	—
For the curious distribution of this plant in the Eastern district, see Rev. Kirby Trimmer's Flora.				
SEMPERVIVUM TECTORUM. Linn.	e.	nc.	sc.	w.

SAXIFRAGACEÆ.

SAXIFRAGA TRIDACTYLITES. Linn.	e.	nc.	sc.	w.
„ GRANULATA. Linn.	e.	nc.	sc.	w.
CHRYSOSPLENIUM OPPOSITIFOLIUM. Linn.	—	nc.	sc.	w.
„ ALTERNIFOLIUM. Linn.	—	nc.	sc.	w.
PARNASSIA PALUSTRIS. Linn.	e.	nc.	sc.	w.

UMBELLIFERÆ.

HYDROCOTYLE VULGARIS. Linn.	e.	nc.	sc.	w.
SANICULA EUROPŒA. Linn.	e.	nc.	sc.	w.
ERYNGIUM MARITIMUM. Linn.	e.	nc.	—	w.
CICUTA VIROSA. Linn.	e.	nc.	—	w.
APIUM GRAVEOLENS. Linn.	e.	nc.	—	w.
HELOSCIADIUM NODIFLORUM. Koch.	e.	nc.	sc.	w.
b. repens	e.	—	—	w.
„ INUNDATUM. Koch.	e.	nc.	—	w.
PETROSELINUM SATIVUM. Hoff.	e.	—	—	—
„ SEGETUM. Koch.	e.	nc.	—	w.
SISON AMOMUM. Linn.	e.	nc.	sc.	w.
ÆGOPODIUM PODAGRARIA. Linn.	e.	—	sc.	w.
CARUM CARUI. Linn.	—	—	—	w.
Lynn, Rev. G. Munford.				
BUNIUM FLEXUOSUM. With.	e.	nc.	sc.	w.
PIMPINELLA SAXIFRAGA. Linn.	e.	nc.	sc.	w.
SIUM LATIFOLIUM. Linn.	e.	nc.	sc.	w.
„ ANGUSTIFOLIUM. Linn.	e.	nc.	—	w.
BUPLEURUM ROTUNDIFOLIUM. Linn.	—	nc.	sc.	w.
Is thus recorded in Munford's List. I have no localities beyond West Norfolk.—H.D.G.				
„ TENUISSIMUM. Linn.	e.	nc.	—	w.
ŒNANTHE FISTULOSA. Linn.	e.	nc.	sc.	w.
„ PIMPINELLOIDES. Linn.	e.	nc.	—	w.
„ SILAIFOLIA. Bieb.	e.	nc.	—	—
„ LACHENALII. Gmel.	e.	nc.	—	w.
„ CROCATA. Linn.	e.	—	—	w.
„ PHELLANDRIUM. Linn.	e.	nc.	sc.	w.
ÆTHUSA CYNAPIUM. Linn.	e.	nc.	sc.	w.
FŒNICULUM VULGARE. Gaert.	e.	nc.	—	w.

SILAUS PRATENSIS. Bess.	e.	nc.	sc.	w.
ANGELICA SYLVESTRIS. Linn.	e.	nc.	sc.	w.
PEUCEDANUM PALUSTRE. Linn.	e.	—	—	w.
Shouldham, Dr. Lowe.				
PASTINACA SATIVA. Linn.	e.	nc.	sc.	w.
HERACLEUM SPHONDYLIUM. Linn.	e.	nc.	sc.	w.
DAUCUS CAROTA. Linn.	e.	nc.	sc.	w.
CAUCALIS DAUCOIDES. Linn.	—	—	—	w.
Fincham, Rev. G. Mundford.				
Marham, Eng. Flora.				
TORILIS INFESTA. Spreng.	e.	nc.	sc.	w.
„ ANTHRISCUS. Gaert.	e.	nc.	—	w.
„ NODOSA. Gaert.	e.	nc.	sc.	w.
CHÆROPHYLLUM ANTHRISCUS. Lam.	e.	nc.	sc.	w.
„ SYLVESTRE. Linn.	e.	nc.	sc.	w.
„ TEMULUM. Linn.	e.	nc.	sc.	—
SCANDIX PECTEN-VENERIS. Linn.	e.	nc.	sc.	w.
CONIUM MACULATUM. Linn.	e.	nc.	sc.	w.
SMYRNIUM OLUSATRUM. Linn.	e.	nc.	sc.	w.

ARALIACEÆ.

HEDERA HELIX. Linn.	e.	nc.	sc.	w.

CORNACEÆ.

CORNUS SANGUINEA. Linn.	e.	nc.	sc.	w.

LORANTHACEÆ.

VISCUM ALBUM. Linn.	e.	nc.	sc.	—

CAPRIFOLIACEÆ.

ADOXA MOSCHATELLINA. Linn.	e.	nc.	sc.	w.
SAMBUCUS NIGRA. Linn.	e.	nc.	sc.	w.
„ EBULUS. Linn.	e.	nc.	sc.	w.
VIBURNUM LANTANA. Linn.	e.	nc.	—	w.
„ OPULUS. Linn.	e.	nc.	sc.	w.
LONICERA CAPRIFOLIUM. Linn.	e.	nc.	sc.	—
Recorded by Rev. Kirby Trimmer.				
„ PERICLYMENUM. Linn.	e.	nc.	sc.	w.

RUBIACEÆ.

GALIUM CRUCIATUM. With. . . . . e. nc. sc. w.
„ VERUM. Linn. . . . . e. nc. sc. w.
„ ERECTUM. Huds. . . . . e. nc. sc. w.
„ MOLLUGO. Linn. . . . . e. nc. sc. w.
„ SAXATILE. Linn. . . . . e. nc. sc. w.
„ PALUSTRE. Linn. . . . . e. nc. sc. w.
c. Witheringii. . . . . — — — w.
Lynn, Dr. Lowe.
„ ULIGINOSUM. Linn. . . . . e. nc. sc. w.
„ ANGLICUM. Huds. . . . . — nc. sc. w.
Thus recorded in Rev. Kirby Trimmer's Flora.
„ APARINE. Linn. . . . . e. nc. sc. w.
„ TRICORNE. With. . . . . — — — w.
Castleacre, Dr. Lowe.
ASPERULA ODORATA. Linn. . . . . e. — sc. w.
Wolferton, Dr. Lowe.
„ CYNANCHICA. Linn. . . . . — nc. — w.
"nc." Rev. Kirby Trimmer.
Marham, Herb. Smith.
SHERARDIA ARVENSIS. Linn. . . . . e. nc. — w.

VALERIANACEÆ.

CENTRANTHUS RUBER. D. C. . . . . e. nc. sc. w.
VALERIANA DIOICA. Linn. . . . . e. nc. sc. w.
„ OFFICINALIS. Linn. . . . . e. nc. sc. w.
VALERIANELLA OLITORIA. Mœnch. . . . . e. nc. — w.
„ DENTATA. Koch. . . . . e. — sc. w.

DIPSACEÆ.

DIPSACUS SYLVESTRIS. Linn. . . . . e. nc. sc. w.
„ PILOSUS. Linn. . . . . e. nc. sc. w.
"Fincham, Rev. W. Blyth," Dr. Lowe.
SCABIOSA SUCCISA. Linn. . . . . e. nc. — w.
„ COLUMBARIA. Linn. . . . . e. nc. — w.
„ ARVENSIS. Linn. . . . . e. nc. sc. w.

COMPOSITÆ.

ONOPORDUM ACANTHIUM. Linn. . . . . e. nc. sc. w.
SILYBUM MARIANUM. Gaërt. . . . . e. nc. — w.
Thorpe Hamlet, H. D. G.
Stiffkey, Morston, and Swaffham,
Rev. E. W. Dowell.
CARDUUS TENUIFLORUS. Curt. . . . . e. nc. — w.
„ NUTANS. Linn. . . . . e. nc. sc. w.
„ CRISPUS. Linn. . . . . e. — sc. w.
„ LANCEOLATUS. Linn. . . . . e. nc. sc. w.
„ ERIOPHORUS. Linn. . . . . — — sc. w.
North Pickenham, Eng. Flora.
"w." Rev. G. Munford's List.
„ PALUSTRIS. Linn. . . . . e. nc. sc. w.
„ PRATENSIS. Huds. . . . . e. nc. sc. w.
„ HETEROPHYLLUS. Linn. . . . . — — sc. —
Mulbarton, Mr. Crowe.
New Bot. Guide.
„ ACAULIS. Linn. . . . . e. nc. sc. w.
„ ARVENSIS. Curt. . . . . e. nc. sc. w.
CARLINA VULGARIS. Linn. . . . . e. nc. — w.
ARCTIUM MAJUS. Schk. . . . . e. nc. sc. —
Thus recorded in Rev. Kirby
Trimmer's Flora.
„ MINUS. Schk. . . . . e. nc. sc. w.
Lynn and Wolferton, Dr. Lowe.
CENTAUREA NIGRA. Linn. . . . . e. nc. sc. w.
„ SCABIOSA. Linn. . . . . e. nc. sc. w.
„ CYANUS. Linn. . . . . e. nc. sc. w.
„ CALCITRAPA. Linn. . . . . e. nc. — w.
Thorpe, Mr. R. Wigham.
Stiffkey, Rev. E. W. Dowell.
Downham, Rev. R. Munford.
„ SOLSTITIALIS. Linn. . . . . e. nc. — w.
CHRYSANTHEMUM SEGETUM. Linn. . . . . e. nc. sc. w.
„ LEUCANTHEMUM. Linn. . . . . e. nc. — w.
MATRICARIA PARTHENIUM. Linn. . . . . e. nc. — w.
„ INODORA. Linn. . . . . e. nc. sc. w.
c. maritima . . . . . — — — w.
Sea Bank, Lynn, Dr. Lowe.

MATRICARIA CHAMOMILLA. Linn.	e.	nc.	sc.	w.
TANACETUM VULGARE. Linn.	e.	nc.	—	w.
ANTHEMIS COTULA. Linn.	e.	nc.	sc.	w.
„ ARVENSIS. Linn.	e.	nc.	sc.	w.
„ NOBILIS. Linn.	e.	nc.	—	—
ACHILLEA MILLEFOLIUM. Linn.	e.	nc.	sc.	w.
„ PTARMICA. Linn.	e.	nc.	—	w.
ARTEMISIA ABSINTHIUM.	e.	nc.	—	w.
„ VULGARIS. Linn.	e.	nc.	sc.	w.
„ CAMPESTRIS. Linn.	—	nc.	sc.	w.
"nc." recorded by Rev. Kirby Trimmer.				
Thetford, Bot. Guide.				
"Devil's Ditch," Cranwich, Miss Rackham.				
„ MARITIMA. Linn.	e.	nc.	—	w.
Yarmouth, Cley, and Lynn.				
b. gallica.	—	—	—	w.
Recorded by Rev. G. Munford.				
FILAGO GERMANICA. Linn.	e.	nc.	sc.	w.
„ SPATHULATA. Presl.	—	—	—	w.
Hunstanton, Prof. Balfour, Dr. Lowe.				
„ MINIMA. Fries.	e.	nc.	—	w.
GNAPHALIUM ULIGINOSUM. Linn.	e.	nc.	sc.	w.
„ LUTEO-ALBUM. Linn.	—	—	sc.	—
Larlingford, Brit. Flora.				
„ SYLVATICUM. Linn.	e.	nc.	—	w.
„ MARGARITACEUM. Linn.	e.	—	—	—
„ DIOICUM.	e.	nc.	—	w.
"e." recorded by Rev. Kirby Trimmer.				
Stratton & Swaffham, Bot. Guide.				
SENECIO VULGARIS. Linn.	e.	nc.	sc.	w.
„ SYLVATICUS. Linn.	e.	nc.	sc.	w.
„ VISCOSUS. Linn.	e.	nc.	—	w.
„ SQUALIDUS. Linn.	—	—	sc.	—
Eaton, introduced by J. W. Ewing.				
„ ERUCIFOLIUS. Linn.	e.	nc.	—	w.

SENECIO JACOBŒA. Linn.	e.	nc.	sc.	w.
„ AQUATICUS. Huds.	e.	nc.	sc.	w.
„ PALUDOSUS. Linn.				
Norfolk, Herb. Smith.				
„ PALUSTRIS. D. C.	e.	nc.	sc.	—
Acle, Scoulton, and St. Faith's, Eng. Flora.				
DORONICUM PARDALIANCHES. Linn.	e.	nc.	sc.	w.
BIDENS CERNUA. Linn.	e.	nc.	—	w.
„ TRIPARTITA. Linn	e.	nc.	sc.	w.
INULA HELENIUM. Linn.	e.	nc.	sc.	w.
„ CONYZA. D. C.	e.	nc.	—	w.
„ (CRITHMOIDES. Linn.)	e.	—	—	—
A single specimen, Caistor, 1784. —Paget's History of Yarmouth.				
„ DYSENTERICA. Linn.	e.	nc.	sc.	w.
„ PULICARIA. Linn.	e.	nc.	—	—
St. Faith's, R. Wigham. Ormesby, Paget.				
BELLIS PERENNIS. Linn.	e.	nc.	sc.	w.
ERIGERON ACRIS. Linn.	e.	—	sc.	w.
ASTER TRIPOLIUM. Linn.	e.	nc.	—	w.
SOLIDAGO VIRGA-AUREA. Linn.	e.	nc.	—	w.
TUSSILAGO FARFARA. Linn.	e.	nc.	sc.	w.
PETASITES VULGARIS. Desf.	e.	nc.	sc.	w.
EUPATORIUM CANNABINUM. Linn.	e.	nc.	sc.	w.
CICHORIUM INTYBUS. Linn.	e.	nc.	sc.	w.
LAPSANA COMMUNIS. Linn.	e.	nc.	—	w.
ARNOSERIS PUSILLA. Gaert.	e.	—	—	w.
HYPOCHÆRIS GLABRA. Linn.	e.	nc.	—	w.
„ RADICATA. Linn.	e.	—	—	w.
„ MACULATA. Linn.	—	nc.	—	—
Recorded by Rev. K. Trimmer, on the authority of R. Wigham.				
LEONTODON HIRTUS. Linn.	e.	nc.	—	w.
„ HISPIDUS. Linn.	e.	nc.	sc.	w.
„ AUTUMNALIS. Linn.	e.	nc.	—	w.
PICRIS HIERACIOIDES Linn.	e.	nc.	sc.	w.
HELMINTHIA ECHIOIDES. Gaert.	e.	nc.	sc.	w.

TRAGOPOGON PRATENSIS. Linn. . . . e. nc. sc. w.
„ (PORRIFOLIUS. Linn.) . . . e. — — —
Banks of the Castle, Norwich, R. Wigham, Rev. Kirby Trimmer.
TARAXACUM OFFICINALE. Wigg. . . . . e. nc. sc. w.
b. erythrospermum . . . — — — w.
Hunstanton, Dr. Lowe.
d. palustre . . . . . e. nc. sc. w.
LACTUCA VIROSA. Linn. . . . . e. nc. sc. w.
„ MURALIS. Fresen. . . . . e. nc. sc. w.
SONCHUS OLERACEUS. Linn. . . . . e. nc. sc. w.
„ ASPER. Hoffm. . . . . e. nc. — w.
„ ARVENSIS. Linn. . . . . e. nc. sc. w.
„ PALUSTRIS. Linn. . . . . e. nc. — —
Recorded in "nc." by Rev. K. Trimmer.
CREPIS FŒTIDA. Linn. . . . . — — — w.
Barton Bendish, Bot. Guide.
„ VIRENS. Linn. . . . . e. nc. — w.
„ BIENNIS. Linn. . . . . — nc. — w.
„ PALUDOSA. Mœnch. . . . . — — — w.
Hunstanton, Rev. G. Munford.
HIERACIUM PILOSELLA. Linn. . . . . e. nc. sc. w.
„ MUROBUM. Linn. . . . . e. nc. — —
„ VULGATUM. Fries.=SYLVATICUM. Sm. — nc. sc. w.
„ MACULATUM. Sm. . . . . e. — — —
Introduced by Mr. Crowe.
„ UMBELLATUM. Linn. . . . . e. — — —
„ BOREALE. Fries. . . . . e. nc. — —
In this difficult genus of which I know nothing myself, I have endeavoured to give the distribution as recorded by Revs. Kirby Trimmer and G. Munford. —H.D.G.

CAMPANULACEÆ.

JASIONE MONTANA. Linn. . . . . e. nc. sc. w.

CAMPANULA GLOMERATA. Linn. . . . . — — — w.
Fincham, Rev. W. Blyth, Dr. Lowe.
„ TRACHELIUM. Linn. . . . . e. nc. — w.
„ LATIFOLIA. Linn. . . . . e. — sc. —
Poringland, R. J. Mann. Kimberley, Eng. Flora.
„ ROTUNDIFOLIA. Linn. . . . . e. nc. sc. w.
„ RAPUNCULUS. Linn. . . . . e. nc. sc. —
„ PATULA. Linn. . . . . — nc. — —
Holt, Bot. Guide.
SPECULARIA HYBRIDA. A.DC. . . . . e. nc. sc. w.

ERICACEÆ.

VACCINIUM OXYCOCCUS. Linn. . . . . e. — sc. w.
„ (MYRTILLUS. Linn.) . . . . e. — — —
Mousehold, said to be planted. H.D.G.
ANDROMEDA POLIFOLIA. Linn. . . . . — — sc. —
Larlingford. Brit. Flora.
ERICA TETRALIX. Linn. . . . . e. nc. — w.
„ CINEREA. Linn. . . . , . e. nc. sc. w.
CALLUNA VULGARIS. Salisb. . . . . e. nc. sc. w.
PYROLA ROTUNDIFOLIA. Linn. . . . . e. — sc. w.
Upton, R. J. Mann. Larlingford, Brit. Flora. Roydon, Dr. Lowe.
„ (MINOR. Linn.) . . . . . e. nc. — w.
I retain this species in deference to Rev. Kirby Trimmer's assurance that he has found it in the County; the only specimen I have seen so named was certainly in error.—H.D.G.
MONOTROPA HYPOPITYS. Linn. . . . . e. nc. sc. —

JASMINACEÆ.

FRAXINUS EXCELSIOR. Linn. . . . . e. nc. sc. w.
LIGUSTRUM VULGARE. Linn. . . . . e. nc. sc. w.

APOCYNACEÆ.

VINCA MAJOR. Linn. . . . . e. nc. sc. w.
„ MINOR. Linn. . . . . e. nc. sc. w.

GENTIANACEÆ.

ERYTHRÆA LITTORALIS. Fries. . . . — — — w.
Holme, Dr. Lowe.
„ CENTAURIUM. Pers. . . . . e. nc. sc. w.
„ PULCHELLA. Fries. . . . . e. — — w.
Yarmouth Denes, Miss Barnard.
CICENDIA FILIFORMIS. Delarbre. . . . — — — w.
Roydon, Mr. Bray, Dr. Lowe.
CHLORA PERFOLIATA. Linn. . . . . e. nc. sc. —
GENTIANA PNEUMONANTHE. Linn. . . . e. nc. — w.
„ AMARELLA. Linn. . . . . e. nc. — w.
„ CAMPESTRIS. Linn. . . . . e. nc. — w.
MENYANTHES TRIFOLIATA. Linn. . . . e. nc. sc. w.
LIMNANTHEMUM NYMPHŒOIDES. Link. . . — — sc. w.
Scoulton, Mr. R. P. Burcham.
Downham, Brit. Flora.

CONVOLVULACEÆ.

CONVOLVULUS ARVENSIS. Linn. . . . e. nc. sc. w.
„ SEPIUM. Linn. . . . . e. nc. sc. w.
„ SOLDANELLA. Linn. . . . e. nc. — w.
CUSCUTA EPILINUM. Weihe. . . . . — — sc. —
Recorded by Rev. Kirby Trimmer.
„ EUROPŒA. Murr. . . . . e. nc. sc. —
„ EPITHYMUM. Murr. . . . e. nc. — w.
„ TRIFOLII. Bab. . . . . e. — — w.
S. Wootton, 1865, Dr. Lowe.

SOLANACEÆ.

SOLANUM DULCAMARA. Linn. . . . . e. nc. sc. w.
„ NIGRUM. Linn. . . . . e. nc. sc. w.
ATROPA BELLADONNA. Linn. . . . . e. nc. — w.
HYOSCYAMUS NIGER. Linn. . . . . e. nc. sc. w.

SCHROPHULARIACEÆ.

VERBASCUM THAPSUS. Linn.	e.	nc.	sc.	w.
„ PULVERULENTUM. Vill.	e.	nc.	sc.	w.
„ LYCHNITIS. Linn.	—	nc.	sc.	w.
„ NIGRUM. Linn.	e.	nc.	sc.	w.
„ VIRGATUM. With.	e.	—	—	—
Norfolk, Brit. Flora.				
Recorded as "e." in Munford's List.				
„ BLATTARIA. Linn.	e.	—	—	w.
Thorpe, R. J. Mann.				
Lynn, Eng. Bot.				
Recorded in "e." by Rev. Kirby Trimmer.				
„ NIGRO-PULVERULENTUM.	e.	nc.	—	w.
Castle Rising, Dr. Lowe.				
SCHROPHULARIA BALBISII. Horneur.	e.	nc.	sc.	w.
„ NODOSA. Linn.	e.	nc.	—	w.
„ VERNALIS. Linn.	—	nc.	—	—
Langham, S. P. Woodward.				
Stiffkey, Eng. Flora.				
DIGITALIS PURPUREA. Linn.	e.	—	sc.	w.
ANTIRHINUM MAJUS. Linn.	e.	nc.	—	w.
„ ORONTIUM. Linn.	e.	nc.	sc.	w.
LINARIA CYMBALARIA. Mill.	e.	nc.	sc.	w.
„ ELATINE. Mill.	e.	—	—	w.
„ SPURIA. Mill.	e.	nc.	sc.	—
„ REPENS. Mill.	e.	—	—	—
Seething, Mr. Wigham.				
„ VULGARIS. Mill.	e.	nc.	sc.	w.
„ MINOR. Desf.	e.	nc.	sc.	w.
LIMOSELLA AQUATICA. Linn.	—	nc.	—	w.
Swanington, H. D. G.				
Ingoldsthorpe, Dr. Lowe.				
VERONICA HEDERIFOLIA. Linn.	e.	nc.	sc.	w.
„ POLITA. Fries.	e.	nc.	sc.	w.
„ AGRESTIS. Linn.	e.	nc.	—	w.
„ BUXBAUMII. Ten.	e.	nc.	—	w.
„ TRIPHYLLOS. Linn.	—	nc.	sc.	w.

VERONICA VERNA. Linn.	—	—	sc.	w.
„ ARVENSIS. Linn.	e.	nc.	sc.	w.
„ SERPYLLIFOLIA. Linn.	e.	nc.	sc.	w.
„ OFFICINALIS. Linn.	e.	nc.	sc.	w.
„ CHAMÆDRYS. Linn.	e.	nc.	sc.	w.
„ MONTANA. Linn.	e.	nc.	—	w.
„ SCUTELLATA. Linn.	e.	nc.	sc.	w.
„ ANAGALLIS. Linn.	e.	nc.	sc.	w.
„ BECCABUNGA. Linn.	e.	nc.	sc.	w.
EUPHRASIA OFFICINALIS. Linn.	e.	nc.	sc.	w.
BARTSIA ODONTITES. Huds.	e.	nc.	sc.	w.
PEDICULARIS PALUSTRIS. Linn.	e.	nc.	sc.	w.
„ SYLVATICA. Linn.	e.	nc.	sc.	w.
RHINANTHUS CRISTA-GALLI. Linn.	e.	nc.	sc.	w.
MELAMPYRUM CRISTATUM. Linn.	—	nc.	—	—
„ ARVENSE. Linn.	e.	nc.	sc.	w.
„ PRATENSE.	e.	nc.	sc.	w.

OROBANCHACEÆ.

OROBANCHE CŒRULEA. Vill.	e.	nc.	sc.	—
„ MAJOR. Linn.	e.	nc.	sc.	w.
„ ELATIOR. Sutt.	—	nc.	sc.	w.
„ MINOR. Linn.	e.	nc.	sc.	w.
„ RAMOSA. Linn.	e.	—	—	w.

Hardly naturalised on hemp.

VERBENACEÆ.

VERBENA OFFICINALIS. Linn.	e.	nc.	sc.	w.

LABIATÆ.

LYCOPUS EUROPŒUS. Linn.	e.	nc.	sc.	w.
MENTHA ROTUNDIFOLIA. Linn. *Round-leaved Mint.*	—	—	sc.	—

Rare. A hedge-bank, Fersfield. Aug., 1859.

„ ALOPECUROIDES. Hull. *Broad-leaved Horse Mint.*	e.	—	—	—

Rare. A hedge-bank, Horstead, Aug., 1860. The figure of this Mint in Syme's edition of Eng. Bot., was taken from a specimen gathered at this station in 1867.

MENTHA SYLVESTRIS. Linn. *Common Horse Mint.* e. — — —
A hedge-bank, Shotesham, Aug., 1866.

" " NEMOROSA. Benth. . . — nc. — —
Wet places, and also on a dry bank, Swannington, Aug., 1869.

" " MOLLISSIMA. Benth. . . — — sc. —
In a wet ditch, Hartford-Bridge, Aug., 1859.

" VIRIDIS. Linn. *Spear Mint.* . . e. — sc. w.
Rare. In a damp wood, Houghton-juxta-Harpley, Sept. 1839. In a wet ditch, Framingham Earl, Sept., 1870. A var. with very hairy calyx teeth, in a wet ditch, Marlingford, Sept., 1847. Baker on English Mints, in Journal of Botany, Aug., 1865, p. 256, mentions a similar form having been found by Dale, and labelled in Buddle's Herbarium as Ray's No. 2.

" PIPERITA. Huds. *Pepper Mint.* . — nc. sc. —
Not common. In swampy places, Holm-Hale, Sept., 1867. In wet places, Heigham, Sept., 1870.

" " VULGARIS. Sole. . . . e. — — —
Moist places, Harleston, Sept., 1866. In a wet ditch, Freethorpe, Sept., 1869.

" CITRATA. Ehrh. . . . . — nc. — —
Very rare. Moist places near the river, Saxthorpe, Aug., 1867.

" HIRSUTA. Linn. *Hairy Water Mint.* e. — — —
Common. Wet places, Crostwick, July, 1856.

MENTHA HIRSUTA SUBGLABRA. Baker. . . e. nc. — —
Not common. In the river, Heigham, Aug., 1870. In a water ditch, Trowse, Sept., 1873.

„ SATIVA. Linn. *Marsh Whorled Mint.* e. — sc. —
Not uncommon. Wet places, Bixley, Blo'-Norton, and Antingham, Aug., 1865.

„ „ PALUDOSA. Sole. . . . — nc. — —
Rare. In a ditch, West Bradenham, Sept., 1874.

„ RUBRA. Sm. *Tall Red Mint.* . . e. nc. — —
Not common. Wet places, Shotesham, Sept., 1869. A form with very hairy leaves, bracteoles, and calyx, in a wet ditch and on a dry bank, Yaxham, Sept., 1863. Baker, English Mints, p. 249, states that a like curious form was gathered by Dr. Windsor, at Partington, Cheshire.

„ GRACILIS. Sole. *Narrow-leaved Mint.* — nc. — —
Rare. A moist place, Scarning, Aug., 1874.

„ „ CARDIACA. Gerarde. *Cardiac Mint.* e. — — —
Rare. On a bank of a water ditch, Blofield, Aug., 1862.

„ ARVENSIS. Linn. *Corn Mint.* . . e. — — —
Common. In a corn field, Poringland, July, 1851.

„ „ NUMMULARIA. "Schreb." . e. nc. — —
Baker, p. 252. In an old gravel pit, Fritton, Aug., 1863. In a ditch, East Dereham, July, 1870.

MENTHA ARVENSIS PRÆCOX. Sole. . . . . — nc. sc. —
In a wet ditch, North Lopham, June, 1870. Wet waste place, Shipdham, July, 1871.

„ „ ALLIONII. "Boreau." . . — nc. sc. —
Baker, p. 253. Growing on the river bank, Garboldisham, July, 1867. Wet ditch, Scarning, Aug., 1869.

„ PULEGIUM. Linn: *Penny Royal.* . e. nc. — w.
Not common. Old wet gravel pits, Newton St. Faith, Sept., 1859. Wet waste place, Great Bircham, September, 1841. Margin of a pool, Arminghall, October, 1863. On the green, Aldborough, September, 1867.

„ „ ERECTA. . . . . e. — — —
A moist ditch, Haynford, Sept., 1873. Professor Syme, Eng. Bot., vol. vii., p. 24, mentions having seen this variety from Great Island, Co. Cork, collected by Mr. Carroll.

THYMUS SERPYLLUM. Linn. . . . . e. nc. sc. w.
ORIGANUM VULGARE. Linn. . . . e. nc. — w.
CALAMINTHA CLINOPODIUM. Sperm. . . e. nc. sc. w.
„ ACINOS. Clairv. . . . . e. nc. sc. w.
„ NEPETA. Clairv. . . . . e. — sc. w.
„ MENTHIFOLIA. Host. . . . e. nc. sc. w.
NEPETA CATARIA. Linn. . . . . e. nc. sc. w.
„ GLECHOMA. Benth. . . . e. nc. sc. w.
SALVIA VERBENACA. Linn. . . . . e. nc. sc. w.
„ PRATENSIS. Linn. . . . . e. — — —
"Horsford Meadow, B. G.," Rev. Kirby Trimmer.

PRUNELLA VULGARIS. Linn. . . . . e. nc. sc. w.
SCUTELLARIA GALERICULATA. Linn. . . . e. nc. — w.

SCUTELLARIA MINOR.	. . . . .	—	nc.	sc. —
"Holt Heath, B. G.," Rev. Kirby Trimmer. Recorded as "sc." by Rev. G. Munford.				
MARRUBIUM VULGARE. Linn.	. . . . .	e.	nc.	sc. w.
BALLOTA NIGRA. Linn.	. . . . .	e.	nc.	sc. w.
STACHYS BETONICA. Benth.	. . . . .	e.	nc.	sc. w.
„ PALUSTRIS. Linn.	. . . . .	e.	nc.	sc. w.
„ AMBIGUA. Sm.	. . . . .	e.	nc.	— w.
„ SYLVATICA. Linn.	. . . . .	e.	nc.	sc. w.
„ ARVENSIS. Linn.	. . . . .	e.	nc.	sc. w.
GALEOPSIS LADANUM. Linn.	. . . . .	e.	nc.	sc. w.
„ VERSICOLOR. Curt.	. . . . .	e.	—	sc. w.
„ TETRAHIT. Linn.	. . . . .	e.	nc.	— w.
LEONURUS CARDIACA. Linn.	. . . . .	e.	nc.	sc. w.
LAMIUM AMPLEXICAULE. Linn.	. . . .	e.	nc.	sc. w.
„ INCISUM. Willd.	. . . . .	e.	nc.	sc. w.
„ PURPUREUM. Linn.	. . . .	e.	nc.	sc. w.
„ ALBUM. Linn.	. . . . .	e.	nc.	sc. w.
„ GALEOBDOLON. Crantz.	. . . .	e.	nc.	sc. w.
AJUGA REPTANS. Linn.	. . . . .	e.	—	sc. w.
TEUCRIUM SCORDIUM. Linn.	. . . .	e.	—	— w.
„ CHAMÆDRYS. Linn.	. . . .	e.	nc.	sc. —
Is thus recorded by Rev. G. Munford. I know of no locality for it but the old City Walls of Norwich.—H. D. G.				
„ SCORODONIA. Linn.	. . . .	e.	nc.	sc. w.

BORAGINACEÆ

ECHIUM VULGARE. Linn.	. . . . .	e.	nc.	sc. w.
PULMONARIA OFFICINALIS. Linn.	. . . .	—	—	— w.
Stow, Mr. Bray, Dr. Lowe.				
LITHOSPERMUM OFFICINALE. Linn:	. . . .	e.	nc.	sc. w.
„ ARVENSE. Linn.	. . . .	e.	nc.	— w.
MYOSOTIS CÆSPITOSA. Schultz.	. . . .	e.	—	sc. w.
„ SYLVATICA. Ehr.	. . . . .	e.	nc.	— —
„ ARVENSIS. Hoffm.	. . . . .	e.	nc.	sc. w.

MYOSOTIS COLLINA. Reich.	e. nc. sc. w.
„ VERSICOLOR. Reich.	e. nc. sc. w.
ANCHUSA ARVENSIS. Bieb.	e. nc. sc. w.
„ SEMPERVIRENS. Linn.	e. nc. sc. w.
BORAGO OFFICINALIS. Linn.	e. nc. sc. w.
SYMPHYTUM OFFICINALE. Linn.	e. nc. — w.
„ (TUBEROSUM. Linn.)	e. — — —
Thorpe, R. J. Mann.	
CYNOGLOSSUM OFFICINALE. Linn.	e. nc. sc. w.
„ (MONTANUM. Lam.)	e. — — —
St. Benedict's Gates, Bot. Guide.	
(ASPERUGO PROCUMBENS. Linn.)	— nc. — —
A weed in Dunton Vicarage Garden.—Rev. E. W. Dowell.	

PINGUICULACEÆ.

PINGUICULA VULGARIS. Linn.	e. nc. sc. w.
UTRICULARIA VULGARIS. Linn.	e. nc. sc. w.
„ MINOR. Linn.	e. nc. sc. w.
„ INTERMEDIA. Hayne.	— nc. — —
Recorded by Rev. Kirby Trimmer.	

PRIMULACEÆ.

HOTTONIA PALUSTRIS. Linn.	e. nc. sc. w.
PRIMULA VULGARIS. Huds.	e. nc. sc. w.
„ OFFICINALIS. Linn.	e. nc. sc. w.
„ "ELATIOR."	e. nc. sc. w.
I have no record as to which of the intermediate forms occur in the different districts. The true ELATIOR, Jacq., has not, so far as I know, been recorded.—H. D. G.	
LYSIMACHIA VULGARIS. Linn.	e. nc. sc. w.
„ (PUNCTATA. Linn.)	
Is recorded in Science Gossip as having been found near Norwich. I have not seen specimens.—H. D. G.	

LYSIMACHIA NUMMULARIA. Linn.	e.	nc.	sc.	w.
„ NEMORUM. Linn.	e.	nc.	—	w.
ANAGALLIS ARVENSIS. Linn.	e.	nc.	sc.	w.
„ CŒRULEA. Sm.	e.	nc.	sc.	w.
Ormesby, Mr. H. G. Glasspoole.				
„ TENELLA. Linn.	e.	nc.	sc.	w.
CENTUNCULUS MINIMUS. Linn.	e.	nc.	—	w.
GLAUX MARITIMA. Linn.	e.	nc.	—	w.
SAMOLUS VALERANDI. Linn.	e.	nc.	sc.	w.

PLUMBAGINACEÆ.

ARMERIA MARITIMA. Willd.	—	nc.	—	w.
STATICE LIMONIUM. Linn.	e.	nc.	—	w.
Long lost in "e." See Paget.				
„ BAHUSIENSIS. Fries.	—	nc.	—	—
Thus recorded by Rev. Kirby Trimmer.				
„ CASPIA. Willd.	—	nc.	—	w.
Holme Marsh, Heacham, Dr. Lowe.				

PLANTAGINACEÆ.

PLANTAGO MAJOR. Linn.	e.	nc.	sc.	w.
„ MEDIA. Linn.	e.	nc.	sc.	w.
„ LANCEOLATA. Linn.	e.	nc.	sc.	w.
„ MARITIMA. Linn.	e.	nc.	—	w.
„ CORONOPUS. Linn.	e.	nc.	sc.	w.
LITTORELLA LACUSTRIS. Linn.	e.	nc.	—	—

CHENOPODIACEÆ.

SUÆDA FRUTICOSA. Forsk.	—	nc.	—	w.
„ MARITIMA. Dum.	e.	nc.	—	w.
SALSOLA KALI. Linn.	e.	nc.	—	w.
SALICORNIA HERBACEA. Linn.	e.	nc.	—	w.
b. procumbens.	e.	—	—	w.
„ RADICANS. Sm.	e.	nc.	—	w.
BETA MARITIMA. Linn.	e.	nc.	—	w.
CHENOPODIUM POLYSPERMUM. Linn.	e.	nc.	—	w.
Lynn, Dr. Lowe.				

CHENOPODIUM OLIDUM. Curt.	e. nc. — w.	
Lynn, Dr. Lowe.		
„ ALBUM. Linn.	e. nc. sc. w.	
„ FICIFOLIUM. Linn.	e. nc. sc. —	
„ MURALE. Linn.	e. nc. sc. w.	
„ HYBRIDUM. Linn.	e. nc. — w.	
„ URBICUM. Linn.	e. nc. sc. w.	
„ RUBRUM. Linn.	e. nc. sc. w.	
„ BOTRYOIDES. Sm.	e. — — w.	
„ GLAUCUM. Linn.	— nc. — w.	
„ BONUS-HERRICUS. Linn.	e. nc. sc. w.	
ATRIPLEX LITTORALIS. Linn.	e. nc. — w.	
„ ANGUSTIFOLIA. Sm.	e. nc. sc. w.	
„ ERECTA. Huds.	e. nc. — w.	
Lynn, Dr. Lowe.		
„ BABINGTONII. Woods.	— nc. — w.	
Sea bank, Lynn and Hunstanton, Dr. Lowe.		
„ ARENARIA. Woods.	e. nc. — —	
Thus recorded by Rev. Kirby Trimmer.		
„ PORTULACOIDES. Linn.	e. nc. — w.	
„ PEDUNCULATA. Linn.	e. — — w.	

POLYGONACEÆ.

RUMEX CONGLOMERATUS. Murr.	e. nc. — w.	
„ NEMOROSUS. Schrad.		
a. viridis.	e. nc. — w.	
b. sanguineus.	e. nc. — w.	
„ MARITIMUS. Linn.	e. nc. — w.	
N. Lynn, Dr. Lowe.		
„ PALUSTRIS. Sm.	e. nc. sc. w.	
„ PULCHER. Linn.	e. nc. sc. w.	
„ OBTUSIFOLIUS. Anet.	e. — — w.	
„ CRISPUS. Linn.	e. nc. sc. w.	
„ AQUATICUS. Linn.	— nc. sc. —	
„ HYDROLAPATHUM. Huds.	e. nc. sc. w.	
„ ACETOSA. Linn.	e. nc. sc. w.	
„ ACETOSELLA. Linn.	e. nc. sc. w.	

POLYGONUM FAGOPYRUM. Linn.	e.	nc.	—	w.
„ CONVOLVULUS. Linn.	e.	nc.	sc.	w.
„ AVICULARE. Linn.	e.	nc.	sc.	w.
f. littorale.	—	nc.	—	—
Recorded by Rev. Kirby Trimmer.				
„ HYDROPIPER. Linn.	e.	nc.	sc.	w.
„ MINUS. Huds.	e.	nc.	sc.	w.
„ PERSICARIA. Linn.	e.	nc.	sc.	w.
„ LAPATHIFOLIUM. Linn.	e.	nc.	sc.	w.
„ AMPHIBIUM Linn.	e.	nc.	sc.	w.
„ BISTORTA. Linn.	e.	nc.	sc.	w.

ELÆAGNACEÆ.

HIPPOPHAË RHAMNOIDES. Linn.	e.	nc.	—	—

THYMELEACEÆ.

DAPHNE MEZEREUM. Linn.	e.	nc.	—	w.
„ LAUREOLA. Linn.	e.	nc.	sc.	—

SANTALACEÆ.

THESIUM HUMIFUSUM. D. C.	—	—	—	w.

ASARACEÆ.

ARISTOLOCHIA CLEMATITIS. Linn.	e.	—	—	—
I have never found any other station recorded for this plant but the ruins of Carrow Abbey. —H. D. G.				

EUPHORBIACEÆ.

EUPHORBIA HELIOSCOPIA. Linn.	e.	nc.	sc.	w.
„ AMYGDALOIDES. Linn.	e.	nc.	sc.	w.
„ PEPLUS. Linn.	e.	nc.	sc.	w.
„ EXIGUA. Linn.	e.	nc.	sc.	w.
Hunstanton, Fincham, Rev. W. Blyth, Dr. Lowe.				
„ LATHYRIS. Linn.	—	nc.	sc.	—
Thus recorded by Rev. G. Munford.				

MERCURIALIS PERENNIS. Linn.	e.	nc.	sc.	w.
„ ANNUA. Linn.	e.	nc.	sc.	w.

CERATOPHYLLACEÆ.

CERATOPHYLLUM AQUATICUM.				
a. demersum.	e.	nc.	sc.	w.
b. submersum.	e.	nc.	—	—

URTICACEÆ.

PARIETARIA DIFFUSA. Koch.	e.	nc.	sc.	w.
URTICA DIOICA. Linn.	e.	nc.	sc.	w.
„ PILULIFERA. Linn.	e.	—	—	—
Yarmouth, Eng. Flora.				
b. dodartii.	—	—	sc.	w.
Upwell, Br. Fl.				
Recorded in "sc." by Rev. G. Munford.				
„ URENS. Linn.	e.	nc.	sc.	w.
HUMULUS LUPULUS. Linn.	e.	nc.	sc.	w.
ULMUS SUBEROSA. Ehr.	e.	nc.	sc.	w.
„ MONTANA. Sm.	e.	nc.	sc.	w.

AMENTIFERÆ.

QUERCUS ROBUR. Linn.	e.	nc.	sc.	w.
c. sessiliflora.	—	nc.	sc.	w.
CASTANEA VULGARIS. Linn.	e.	nc.	sc.	w.
FAGUS SYLVATICA. Linn.	e.	nc.	sc.	w.
CORYLUS AVELLANA. Linn.	e.	nc.	sc.	w.
CARPINUS BETULUS. Linn.	e.	nc.	sc.	w.
ALNUS GLUTINOSA. Linn.	e.	nc.	sc.	w.
BETULA ALBA. Linn.	e.	nc.	sc.	w.
MYRICA GALE. Linn.	e.	—	sc.	w.
POPULUS ALBA. Linn.	e.	nc.	sc.	w.
„ CANESCENS. Sm.	e.	nc.	sc.	—
„ TREMULA. Linn.	e.	nc.	—	w.
„ NIGRA. Linn.	e.	nc.	sc.	w.
SALIX FRAGILIS. Linn.	e.	—	sc.	—
b. decipiens.	e.	—	—	—

SALIX ALBA. Linn.	e.	nc.	sc.	w.
c. vitellina.	e.	—	sc.	w.
Babingley, Dr. Lowe.				
„ TRIANDRA. Linn.	e.	—	sc.	—
c. amygdalina.	e.	nc.	—	—
„ PURPUREA. Linn.	e.	—	—	—
c. Lambertiana.	e.	nc.	—	—
„ RUBRA. Huds.				
b. Forbyana.	e.	—	—	w.
c. Helix.	e.	—	sc.	w.
„ VIMINALIS. Linn.	e.	nc.	sc.	w.
„ STIPULARIS. Sm.	—	nc.	sc.	—
„ CINEREA. Linn.	e.	nc.	sc.	w.
b. aquatica.	e.	—	—	w.
c. oleifolia.	e.	nc.	sc.	w.
„ AURITA. Linn.	e.	nc.	—	w.
Roydon, Prof. Balfour, Dr. Lowe.				
„ CAPREA. Linn.	e.	nc.	sc.	w.
„ (PHYLICIFOLIA. Linn.				
e. Croweana.)	—	—	—	w.
Mr. Crowe is said to have never found but one tree wild in the county.				
„ NIGRICANS. Sm.	—	—	—	w.
b. cotinifolia.	—	nc.	sc.	—
h. hirta.	—	nc.	sc.	—
„ REPENS. Linn.	e.	nc.	sc.	w.
b. fusca.	e.	nc.	sc.	w.
e. parvifolia.	—	—	—	w.
g. argentea.	e.	—	—	w.

CONIFERÆ.

PINUS SYLVESTRIS. Linn.	e.	nc.	sc.	w.
JUNIPERUS COMMUNIS. Linn.	e.	nc.	—	—
Thus recorded by Rev. Kirby Trimmer.				
TAXUS BACCATA. Linn.	e.	nc.	—	—

ADDITIONS, FEBRUARY 1876.

ARABIS PERFOLIATA. Lam. . . . . e. nc. — —

SAGINA CILIATA. Fries.
"e." and "w." Mr. H. C. Watson.*

ULEX GALLII. Planch. . . . . — nc. — —
Felbrigg, Rev. W. Newbould.

ONONIS SPENOSA. Linn.
"w." Mr. H. C. Watson.

POTERIUM MURICATUM. Spach.
Rev. W. Newbould.

PIMPINELLA MAGNA. Linn.
"w." Mr. H. C. Watson.

LACTUCA SCARIOLA. Linn.
"e." Mr. H. C. Watson.

" SALIGNA. Linn. . . . . — nc. — —
Warham, 1871, Rev. Kirby Trimmer.

MENTHA GENTILIS. Linn. *Bushy Red Mint.* . — — sc. —
Not common. On a bank of a rivulet, Wood Rising, August, 1862. Rev. Kirby Trimmer.

ORIGANUM VULGARE. Linn. . . . . — — sc. —
Hempnall, Rev. Kirby Trimmer.

" VAR PRISMATICUM. . . . . — — sc. —
Hardwicke by Shelton, September, 1875, Rev. Kirby Trimmer.

STACHYS GERMANICA. Linn.
Norfolk, E. B.; 3rd ed.

MYOSOTIS PALUSTRIS. With. . . . . e. nc. sc. w.

* Mr. H. C. Watson in his privately printed "Topographical Botany," adopts a division of the County into "east" and "west" by the Mathematical Line of 1° east longitude; I cannot, therefore, say to which of my four divisions the plant belongs. H. D. G.

TRANSACTIONS

OF THE

Norfolk and Norwich

NATURALISTS' SOCIETY;

Presented to the Members for

1875–76.

VOL. II.—PART II.

Norwich:
PRINTED BY FLETCHER AND SON.
1876.

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Beeston J. D.
Beverley M., M.D., V.P.
Bidwell W. H.
Bignold E. S.
Birkbeck W., *Thorpe*
Blake R., *Bracondale*
Bloomfield Rev. E. N., *Guestling Rectory, Hastings*
Boileau Lieut. Col., *Stanfield Hall*
Bond Frederick, F.Z.S., *Fairfield Avenue, Staines*
Bond W.
Boulton W. S.
Brewer Julian C.
Bridgman J. B., President
Brown Rev. J. L.
Brownfield J.
Burcham R. P.
Butcher H. F.
Buxton Geoffry F.
Buxton J. H., *Easney, Ware*
Buxton S. G., *Catton Hall*

C.

Capon C. H.
Cockburn Miss, *Bracondale*
Colman J. J., M.P., *Carrow House*
Cooke M. C., *Hon. Mem., Upper Holloway, London*
Cooper R.
Cooper R. A.
Corder O.
Cresswell F. J., *Lynn*
Cresswell George, *Lynn*
Crompton Rev. J., V.P., *Bracondale*
Crowfoot W. M., *Beccles*
Cupiss Francis, *Diss*

D.

Davie Rev. C. R. Ferguson, *Yelverton*
Dix Francis
Dowson E. T., *Geldeston*

E.

Eade Peter, M.D.

F.

Farn A. B., *The Dartons, Dartford*
Farrer J. D.
Field E.
Fitch R., F.G.S.
Flatt Herbert
Fletcher B. E.
Foster Mrs. Charles, *Thorpe*
Frere Rev. H. T., *Burston Rectory*

G.

Gatcombe J., *Lower Durnford Street, Stonehouse*
Geldart H. D., V.P., *Thorpe Hamlet*
Glasspole H. G., *Hunter Street, Brunswick Square, London*
Gunn John, F.G.S.
Gunn T. E.
Gurney Henry, *Nutwood, Reigate*
Gurney John, F.Z.S., *Sprowston Hall*
Gurney J. H., F.Z.S., *Hon. Mem., Northrepps Hall*
Gurney J. H., jun., F.Z.S., *Northrepps Hall*

H.

Haldinstein W.
Hamond Capt. Philip, R.N., *Mousehold House*
Hamond Charles, *Mousehold House*
Harcourt W. B.
Harmer F. W., F.G.S., *Cringleford*
Harting J. E., 24, *Lincoln's Inn Fields, London*
Hebbert C. T., *Hunstanton Lodge*
Hills W. C., M.D., *Thorpe Asylum*
Hodgson Mrs.
Hooker J. D., C.B., M.D., President of the Royal Society, *Hon. Mem., Royal Botanic Gardens, Kew*
Hope Rev. C. A., *Upper Hellesdon*
Hose Rev. T. C., *Roydon, Diss*
Howes Rev. Charles

K.

Kent A.
Keighly T. D., *Great Yarmouth*
King A.
King H. D.
King J.
Kitton F., V.P.

L.

Laurence Rev. J. A., *Dilham*
Le Pelley Rev. J. L.
Lowe John, M.D., *Hon. Mem., Lynn*
Lubbock Rev. Richard, *Hon. Mem., Eccles Rectory*
Luscombe Mrs., *Old Lakenham*
Lynn Natural History Society, President of, *Hon. Mem.*

M.

Manning Rev. C. R., *Diss Rectory*
Marsham Rev. H. P., *Rippon Hall*
Martineau Miss, *Bracondale*
Master A.
Morgan A. M. F.
Mottram A.
Muriel C. E.

N.

Newcome F. D'Arcy, *Feltwell Hall*
Newton Professor, F.R.S., *Hon. Mem., Magdalen College, Cambridge*
Norton Henry, F.G.S.

O.

Orfeur J.

P.

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Partridge Rev. W. H., *Rickinghall Superior*
Patman J.
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Pinder T. Richmond
Plowright C. B., *Hon. Mem., Lynn*
Purdy R. J. W., *Woodgate House, Aylsham*

R.

Reeve J.
Robbins Miss
Robinson H. S.

S.

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Smith W.
Sothern S. C.
Southwell C., *Gurrey Lodge, Hendon, N.W.*
Southwell T., F.Z.S., *Hon. Sec.*
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Stevenson H., F.L.S., V.P.
Stracey Miss, *Rackheath Hall*
Sutton Francis
Sutton Frederick, *Wellingham by Stow*

T.

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Todd J. T.
Toll Octavius
Tracey Rev. F. F., *Beccles*
Turner Horace

U.

Upcher H. M., F.Z.S., *Felthwell Rectory*
Utting S. W., *Thorpe Hamlet*

W.

Waddell J. C., M.D.
Walter J. H., *Hellesdon Lodge*
West A., *Wymondham*
Wheeler Rev. T. A.
Wheeler F. D.
White R. W.
Wild Edward
Williams C.
Wilson G.

The Treasurer in Account with the Norfolk and Norwich Naturalists' Society, year ending 28th March, 1876.

Dr.

	£	s.	d.
To Balance from last year	24	7	11
,, 132 Subscriptions for the year 1875—76	33	0	0
,, Additional payments for monthly notice of Meetings	0	16	0
,, Sale of *Transactions*	4	4	6
,, Interest	0	12	11
	£63	1	4

Cr.

	£	s.	d.
By Fletcher and Son, for Printing *Transactions*, 1874—75	25	10	0
,, for Wrappers for *Transactions*	0	6	0
,, Stevenson and Co., for Printing	2	0	9
,, Postage and Carriage	3	5	6
,, Miller and Leavins, for note paper	0	12	6
,, G. Quinton, for Binding	0	3	0
,, J. Rice, for Book Cabinet	2	10	0
,, J. & J. King, for painting and graining ditto ...	0	10	6
,, Annual Subscription to Museum	2	2	0
,, Assistant Secretary's Salary	5	0	0
,, Balance in hand	21	1	1
	£63	1	4

Examined and found correct,

W. H. BIDWELL, *Auditor*.

List of the Publications received by the Society as Donations or Exchanges.

BELFAST.

Eighth, Ninth, and Tenth Annual Reports of the Belfast Naturalists' Field Club, for the years ending 31st March, 1871—73. 3 nos. 8vo. . *Belfast*, 1871—73

Annual Report and Proceedings of the Belfast Naturalists' Field Club, for the year ending 31st March, 1874. (Eleventh year.) New Series, Vol. I, Part 1. 8vo. *Belfast*, 1875

Guide to Belfast and the adjacent Counties; by Members of the Belfast Naturalists' Field Club. 12mo. *Belfast*, 1874

From the Belfast Naturalists' Field Club.

BRISTOL.

Proceedings of the Bristol Naturalists' Society for the years 1869—72. New Series, Vols. IV—VII. 8vo. *Bristol*, 1870—73

Proceedings of the Bristol Naturalists' Society. New Series, Vol. I, Parts 1 and 2. 8vo. . *Bristol*, 1874—75

List of the Officers and Council, Annual Report, List of Members, Additions to the Library, of the Bristol Naturalists' Society for the years 1873—75. 8vo. *Bristol*, 1873—75

Laws of the Bristol Naturalists' Society, 1875. 8vo. *Bristol, n.d.*

From the Bristol Naturalists' Society.

CAMBRIDGE.

Cambridge University Natural Science Club. Founded March 10th, 1873. Rules, List of Members, and Papers read before the Club. 8vo. . *Camb.*, 1876

From the Cambridge University Natural Science Club.

EDINBURGH.

Transactions of the Botanical Society. Vols. XI, and XII, part 1. 8vo. . . *Edinb.* 1871—74

Extracts from the Opening Address of the President of the Botanical Society of Edinburgh, on 3rd November, 1870; by Sir Walter Elliott, K.S.I., F.L.S., President. 8vo. *Edinb.*, 1871

Royal Botanic Garden of Edinburgh. Founded in 1670. Reports for the years 1873—74. 8vo.

From the Botanical Society of Edinburgh.

GLASGOW.

Proceedings of the Natural History Society of Glasgow. Vol. I, and Vol. II., Part 1. 8vo. *Glasgow*, 1868—75

From the Glasgow Natural History Society.

LIVERPOOL.

Report of the Liverpool Naturalists' Field Club, for the years 1865—66 to 1867—68. 3 nos. 8vo. *Liverpool*, 1866—68

Proceedings of the Liverpool Naturalists' Field Club, for the years 1868—69 to 1874—75. 7 nos. 8vo. *Liverpool*, 1869—75

Synopsis and List of British HYMENOMYCETES, arranged according to the epicrisis of M. Fries; by the Rev. H. H. Higgins, M.A. 8vo. . *Liverpool, n.d.*

Synopsis and List of British GASTEROMYCETES; by the Rev. H. H. Higgins, M.A. 8vo. . *Liverpool, n.d.*

From the Liverpool Naturalists' Field Club.

NEW SOUTH WALES.

Mammalia, recent and extinct; an Elementary Treatise for the use of the Public Schools of New South Wales; by A. W. Scott, M.A. Sm. 8vo. . *Sydney*, 1873

From the Author.

NEW ZEALAND.

Transactions and Proceedings of the New Zealand Institute, 1869—74. Edited and published under the authority of the Board of Governors of the Institute; by James Hector, M.D., F.R.S. Vols. II—VII. 8vo.
Wellington, 1870—75

Fishes of New Zealand. Catalogue, with Diagnoses of the Species; by Frederick Wollaston Hutton, F.G.S. Notes on the Edible Fishes, by James Hector, M.D. 8vo.
Wellington, 1872

Catalogue of the Birds of New Zealand, with Diagnosis of the Species; by Frederick Wollaston Hutton, F.G.S. 8vo. . . . . *Wellington*, 1871

From the New Zealand Institute.

NORWAY.

Forekomster af Kise i visse Skifere i Norge; af Amund Helland, udgivet ved E. B. Münster. 4to.
Christiania, 1873

Om Skuringsmærker, Glacialformationen, Terrasser og Strandlinier, samt om grundfjeldets og sparagmitfjeldets mægtighed i Norge. I. Grundfjeldet. II. Sparagmitfjeldet. Af Prof. Theodor Kjerulf. 4to.
Christiania, 1871—73

Carcinologiske Bidrag til Norges Fauna; af G. O. Sars. I. Monographi over de ved Norges Kyster forekommende Mysider. Forste hefte. Andet hefte. 4to.
Christiania, 1870—72

On some Remarkable Forms of Animal Life, from the great deeps off the Norwegian Coast. Partly from Posthumous Manuscripts of the late Professor Dr. Michael Sars; by George Ossian Sars. 4to. *Christiania*, 1872

Jættegryder, og gamle Strandlinier i fast Klippe; af S. A. Sexe. Med Træsnit. [On Giants' Caldrons and Old Coast Lines in Hard Rocks.] 4to. *Christiania*, 1874

Enumeratio Insectorum Norvegicorum. Fasciculus I., Catalogum Hemipterorum et Orthopterorum continens; auctore H. Siebke. 8vo. . . *Christiania*, 1874

From L'Université Royale de Norvège à Christiania.

NORWICH.

A Sketch of the Collection of Raptorial Birds in the Norwich Museum: by John Henry Gurney. 12mo. *London, n.d.*
From the Norfolk and Norwich Museum.

PLYMOUTH.

Annual Report and Transactions of the Plymouth Institution and Devon and Cornwall Natural History Society, 1856—57, 1859—60, and 1861—62 to 1864—65. 6 nos. 8vo. . . . *Plymouth*, 1857—65

Annual Report and Transactions of the Plymouth Institution and Devon and Cornwall Natural History Society. Vol. II, 1865—67; Vol. III, 1867—69; Vol. IV, 1869—73; Vol. V, Part 1, 1873—74. 8vo.
Plymouth, 1866—74
From the Plymouth Institution.

UNITED STATES OF AMERICA.

Annual Reports of the Board of Regents of the Smithsonian Institution, showing the operations, expenditures, and condition of the Institution for the years 1869—74. 6 vols. 8vo. . . *Washington*, 1871—75
From the Smithsonian Institution.

Proceedings of the Essex Institute. Vol. VI, 1868. 8vo.
Salem, 1870

Communications of the Essex Institute. Vol. VI., 1867—70. 8vo. . . . . *Salem*, 1871

Bulletin of the Essex Institute. Vol. I., 1869. 8vo.
Salem, 1870

An Historical Notice of the Essex Institute. 8vo.
Salem, 1865

Memoir of Francis Peabody, President of the Essex Institute; by Charles W. Upham. 8vo. . *Salem*, 1868
From the Essex Institute.

Synopsis of the Flora of Colorado, by Thomas C. Porter and John M. Coulter. 8vo. . . *Washington*, 1874

Birds of the North-west: a handbook of the Ornithology of the region drained by the Missouri River, and its Tributaries; by Elliott Coues. 8vo. *Washington*, 1874

UNITED STATES OF AMERICA.—*Continued:*

Abstract of Results of a Study of the Genera Geomys and Thomomys, with addenda on the Osteology of Geomyidæ, and on the Habits of Geomys Tuza; by Dr. Elliott Coues. [Being the third part of the Report of Major Powell's Exploration of the Colorado River of the West and its Tributaries. pp. 217—291.] 4to.
Washington, 1875

Some Account of Zapus hudsonius; and on the Breeding Habits, Nest, and Eggs of the White-tailed Ptarmigan, Lagopus leucurus; by Dr. Elliott Coues. 8vo.
Washington, 1875

An Account of the various publications relating to the Travels of Lewis and Clarke, with a Commentary on the Zoological Results of their Expedition; by Dr. Elliott Coues. 8vo. . *Washington*, 1876

Report of the United States Geological Survey of the Territories; by F. V. Hayden. Vol. VI. Contributions to the Fossil Flora of the Western Territories. Part 1. The Cretaceous Flora; by Leo Lesquereux. 4to. . . . *Washington*, 1874

Annual Report of the United States Geological and Geographical Survey of the Territories, embracing Colorado, being a Report of Progress of the Exploration for the year 1873; by F. V. Hayden. 8vo. *Washington*, 1874

Bulletin of the United States Geological and Geographical Survey of the Territories. No. 1. 8vo. *Washington*, 1874

List of Elevations, principally in that portion of the United States, West of the Mississippi River. Collected and arranged by Henry Gannett. 8vo. *Washington*, 1875

Catalogue of the Publications of the United States Geological Survey of the Territories; by F. V. Hayden. 8vo.
Washington, 1874

From Dr. F. V. Hayden, United States Geologist-in-charge.

WATFORD.

Transactions of the Watford Natural History Society, and Hertfordshire Field Club. Vol. I., Parts 1, 2, and 3. 8vo. . . . *Watford*, 1875—76

From the Watford Natural History Society.

ADDRESS

Read by the President, Mr. J. B. Bridgman, *to the Members of the Norfolk and Norwich Naturalists' Society at their Seventh Annual Meeting, held at the Norfolk and Norwich Museum, March 28th, 1876.*

Ladies and Gentlemen—The time has arrived for me to vacate the very honourable post to which you elected me twelve months ago, an honour which I have deeply felt, more especially so, as I am painfully aware of my own short comings; my only claim to your indulgence is that I have done my best: I will not detain you, however, with apologies, as my address is, I fear; already too long, but materials have so accumulated, that the difficulty has been in condensing the materials at my command.

The Society I am happy to say continues in a very flourishing condition, fresh members are continually joining us, but we should be very glad to receive more papers than we do on the various branches of Natural History from our working members, of which there must be many.

The "Norfolk Fauna and Flora" is indebted to Mr. H. D. Geldart for the continuation of his list of *Flowering Plants*, this list is especially valuable, coming from so well known and accurate an observer.

To Mr. John Quinton, jun., the Society is again indebted for his *Meteorological Summary*, especially valuable for the accuracy with which it is compiled; we must also thank the Meteorological Society for their permission to publish these summaries.

In May, Mr. Corder read a short but interesting paper on the *Musk of Commerce*, he also exhibited a pod in which it is secreted and a caddy in which it is imported.

In June a short paper by Mr. Plowright was read on the *Fungi*

observed by him at Scoulton on the occasion of our visit to that place, and our thanks are especially due to that gentleman, as this paper is the only practical result of the past year's excursions.

To our indefatigable Hon. Secretary we are as usual greatly indebted. During the past year he has contributed two papers, the first of which occupied our April and June meetings, and consisted of an elaborate and interesting account of those *Cetacea* inhabiting or occurring in the British seas; a paper the production of which must have involved a considerable amount of time and labour; it was illustrated with maps and diagrams also drawings of some of the typical species. After stating the difficulty attending the study of the order, consequent upon the unwieldy size of many of the species, and the great rarity of others, he pointed out the place assigned them in the animal kingdom, and gave a general outline of their classification, which, he said, is based in the first instance upon the absence or presence of teeth; the sub-order in which no teeth are present being designated *Mystacoceti* or Whale-bone Whales, whilst those in which true teeth are found, embracing by far the larger number of individuals, are grouped together under the sub-order *Odontoceti* or toothed Whales. To the former division belong the Northern Right Whale, which has probably never occurred on our shores, (the Right Whale of the British coast there is every reason to believe was the small Atlantic species *Balæna biscayensis*, now extinct or of great rarity,) and the Roquals, five species at least of which are known to have occurred in the seas surrounding our Islands. To the toothed section, a numerous sub-order represented by about fifteen species known to have occurred in our seas, belong the Sperm Whale, Grampus, Narwhal, Dolphin and common Porpoise. He then proceeded to take each British species separately, giving an account of its habits and distribution, and exhibited a table which he had drawn up, showing at a glance the chief points of difference between the British Whale-bone Whales, which he thought might be useful in identifying specimens cast on shore. Mr. Southwell incidentally mentioned that formerly Lynn and Yarmouth were actively engaged in the Whale fishery, which was discontinued in

the early part of the present century, possibly he said in 1830, that having been a most disastrous year to this fishery. I have given a particular outline of this paper as it is too long for publication in our transactions.

At the November meeting Mr. Southwell read his second paper, the subject of which was the recent forms of the order *Sirenia*, a curious and little known group of animals restricted to two living genera, *Manatus* and *Halicore*, and one genus recently extinct known as *Rhytina*; this very interesting paper has since appeared in another publication.

In May the Secretary read some extracts from the journal of that very excellent naturalist, Robert Marsham, Esq., F.R.S., giving an account of the severe winter of 1739-40, being his own experience and that of his friend Mr. Partridge of London; for these extracts, (which will be found printed in our Transactions, and are of very great interest) we are greatly indebted to the Rev. H. P. Marsham of Stratton: to that gentleman, however, we owe a still deeper debt of gratitude for placing at our disposal ten unpublished letters, written by Gilbert White of Selborne, to his great grandfather the Robert Marsham before referred to: these letters will also be printed in the Transactions illustrated by an autotype *fac-simile* of the Author's writing and signature; they are written in the delightfully discursive style which rendered Gilbert White so deservedly popular. I need not refer to their contents more than to call attention to the fact that Mr. Marsham obtained at Stratton a bird *(Tichodroma muraria)* not known to have been before observed in this country: Gilbert White's remark that Mr. Marsham would "have the satisfaction of introducing a new bird of which future ornithologists will say—found at Stratton in Norfolk by that painful and accurate naturalist, Robert Marsham, Esq.," after an interval of 82 years will at length be fulfilled. To Professor Bell, now the occupant of White's house and the diligent collector of every memorial of him, we are under the great obligation of receiving copies of Marsham's letters to White, thus enabling us to complete the correspondence of the two eminent naturalists. For the notes accompanying the letters we are indebted to Mr. J. E. Harting and Professor Newton.

At the October meeting we were favoured by the Rev. J. Bates with a very interesting paper on *Fogs and Mists*, which was profusely illustrated with diagrams and drawings; many of the latter were the work of a Norwich artist, the late Mr. Leman, kindly lent by Mr. Crompton.

In January, Mr. H. D. Geldart read some very interesting notes on *Seaweeds*. The principal points alluded to in this paper were, 1st, *The Dimorphism of the Fructification of the Rhodosperms or Florideæ, and the analogy of this Dimorphism to that found in other higher orders of Cryptogams;* and 2nd, *The aggregate character of such Chlorosperms as Ulva.*

The true spores and tetraspores of the *Rhodosperms* were described in four different genera—*Plocamium*, *Nitophyllum*, *Ceramium* and *Polysiphonia*, and it was explained that the object of the two-fold fructification was not at all understood, but that it was supposed that while in the case of the true spores the descent of the species was direct, in that of the tetraspores there was an "*alternation of generations*," the germination of the tetraspores producing in the first instance a prothallus unlike either the original parent or the second generation. In describing the *Antheridia* of the *Rhodosperms* the writer acknowledged that although he had seen them he had failed in either tracing their action himself, or in finding in any text book a definite account of how fertilization was effected by their means.

The pseudo analogy between the true spores and the tetraspores of *Rhodosperms* and the Micro- and Macro-spores of *Selaginella* and *Isoetes* was alluded to, and the probable true analogy between the tetraspore and the primary four-fold aggregation of the macro-spore in *Isoetes*, and the development of the spores in Mosses was pointed out, and it was asserted that from specimens in the writer's possession the primary four-fold division of the cell, which forms the tetraspore *Callithamnion* could be shewn.

In speaking of *Ulva* it was shewn that from his own observation the writer had come to the conclusion (which he had since found published by Professor Thiselton Dyer, in Art. "Biology" "Enc. Brit.") that the frond of *Ulva* must be considered as an aggregate of simple forms of *Algæ*, having a true analogue in

Volvox globator. Mr. Geldart intimated that should opportunity again present itself, he would still further pursue this very intricate and interesting subject.

A paper was read at our February meeting by Mr. Geldart, contributed by Mr. F. Norgate of Sparham, on the *Destruction of many Birds through the ignorance of gamekeepers and gardeners*, he also explained the use of nesting boxes; as the paper itself will be published, I need not enter into the details of it. At the same meeting, Mr. J. H. Gurney, jun. gave a lecture, entitled *The Rambles of a Naturalist in Egypt*, which was almost entirely confined to the ornithology of the country, which he said was remarkable for the number of aquatic birds that make the Nile their home, and that to observe their nidification was the principal object of his visit last year: he stated that the number of birds indentified by him was 223, a number far exceeding that observed in Algeria. He then stated the number of game birds shot by himself and friends, consisting of snipe, quail, two species of sand grouse, and ducks, (but for these latter they were too late to kill many,) shewing that there was plenty of temptation for the sportsman as well as the naturalist, and that the snipe shooting of the Delta, was equal if not superior to the best in India. In some of the lakes the Coots were in such abundance that on the water he mistook them for an Island, and when they rose they looked like the smoke out of the funnel of a steamboat. Flamingos, also, were in prodigious numbers. After mentioning the names of those Naturalists who had written on Egypt, he informed us that he hoped ere long to add a work of his own to those already published.

In touching on the subject of migration, Mr. Gurney broached (to me, at least), a new theory, namely, that some of our summer migrants amongst the Insessores may be considered to breed in Southern Africa in winter as well as in England in the summer, and thus really may be double brooded. He remarked that though the outlines of the Egyptian Goose and the Ibis on the monuments are extremely accurately drawn, the colouring was very far from natural.

Their chief discovery was that of the lesser white fronted goose, (*Anser minutus*, Naum,) in Egypt, a bird which was formerly

supposed to have been a Northern species. Many writers had indentified the Sacred Hawk with the Kestril; this Mr. Gurney thought was a mistake, he believed it was intended for the Lanner falcon, an opinion, which he informed us was shared by his father; this latter bird is far from common. He also stated that birds of prey abounded, and that there was an unlimited amount of food for them in the shape of countless hordes of semi-wild pigeons; and that Kites and Vultures, (these latter popularly called Pharaoh's hens,) are the sanitary police or scavengers, and for this useful but disgusting service they are very favourably looked upon; and he believed that it was sight which guided these raptores to their food and not scent. The Sacred Ibis he informed us, contrary to the general opinion of ordinary mortals, no longer inhabited Egypt, but had gone further south. He then entered into a description of the different kinds of Herons, as well as the peculiar method of catching Coots on the lakes with a casting net, which bird is there more highly prized by the fishermen for the table than the wild ducks: after alluding to the Ravens, Mr. Gurney finished a very interesting lecture by glancing at the Entomology of the country, which as far as he was concerned, was confined to some of the noxious insects; fleas, flies, and mosquitoes, he said were in enormous hosts, and rendered themselves exceedingly disagreeable.

Our thanks are due to Mr. Stevenson for his very valuable ornithological summary for the past year, also to Mr. J. H. Gurney and to Mr. J. H. Gurney, jun., for interesting notes. Dr. Lowe has called attention to the occurrence of a rare alga *Clathrocystis æruginosa* in this country. Mr. Geldart is also a contributor to the Botanical notes.

Four excursions were organized by the Committee, and very ably carried out by the excursion Secretary, Mr. Orfeur, to whom the Society is greatly indebted. Excepting on one occasion, the principal element of enjoyment was present, I mean fine weather, but these excursions, although successful in many points of view, were not productive of much fruit, looking at them in a scientific light, as with the exception of Mr. Plowright's list of the Fungi

found by him at Scoulton, not a single specimen, animal or vegetable, has been exhibited, or even a notice of anything observed at any one of the four placed before the Society at its usual meetings. It is much to be regretted we do not follow the example of some other Societies, or in fact pursue the course proposed when this Society was first formed. Let a day and place be fixed for the excursion, and each when there follow his own bent, at the close of the day let each individual produce the result of his labours; this might perhaps induce other members to become active naturalists, but at present, I must confess it seems to me that our trips have degenerated into a series of very pleasant picnics. I hope you will not suppose that I would discourage these excursions; far from it, for while we can induce ladies and gentlemen to attend these and our monthly meetings, there is a chance of awakening an ardent love for some branch of natural history, which may, perhaps, one day be useful to the Society.

The first excursion on May 18th, was to Wroxham and Woodbastwick; the latter was reached by a pleasant row on the North river, the hall and grounds of A. Cator, Esq., being very kindly thrown open to the Society.

The second field-day was on June 15th to Scoulton Mere. This is always a favourite excursion, we have visited it four times; I would recommend those of our members and friends who have not already done so, to read Mr. Stevenson's very interesting and exhaustive paper on Scoulton Mere and the Gulls, it will be found in our Transactions for 1871-2.

The July excursion I am sorry to say was not so pleasant as it might have been, but that was rather due to the weather than to any fault of ours, for it rained hard from morning till night; had the weather not interfered with the comfort of the party, I have no doubt that Wolterton and Blickling would have proved quite as interesting and pleasant as the others, more especially as it was undertaken at a time of year when the country itself is lovely without any further adjunct; perhaps the only thing in favour of the day, was the absence of dust.

The fourth excursion was to Worstead and Westwick. After

viewing the fine church at the former place, the party proceeded to Westwick Hall, J. B. Petre, Esq. having kindly given permission to view the grounds and lake, on which were great quantities of semi-domesticated fowl; also to inspect his collection of birds, fossils, &c. at the Hall.

For many objects of interest exhibited, we have again to thank Messrs. Bayfield and Burcham; the former gentleman at the October meeting exhibited a young specimen of *Eucalyptus globulus*, (of which much mention has been made of late,) grown by himself; he stated that the flora of Australia is peculiar for the paucity of fruit bearing species, and the general dullness of the greens of the foliage, and referred to the valuable disinfecting properties and rapid growth of the tree. Mr. Southwell exhibited specimens of flowering plants and ferns collected by him during an excursion to Norway, and Mr. Corder at the same meeting showed a collection of dried flowers which he had made in Switzerland, amongst which were capital specimens of *Gnaphalium leontopodon* (or Edelweiss). Mr. Corder stated that he was astonished at the profusion of flowering plants at the snow line, and the bright colour of the blossoms, which had not departed even in their dried condition. At the November meeting, Miss Barnard exhibited a number of beautifully mounted dried plants collected by herself in France and Switzerland during the year of 1874.

To this, I cannot say brief *resumé*, I propose to add the result of my doings and observations among the Aculeate Hymenopterous insects during the past season; which has been the worst I have had for this purpose, since I commenced the study, for though in novelties and rarities I have had no reason to complain, yet the days on which they could be collected have been very few; a few in April, the end of May and beginning of June, and a fortnight in August were about the only occasions when there was a succession of fine weather.

Many causes probably combined to render these insects so scarce in the past season; to the want of fine weather must be added in some degree, the long continued cold of the previous winter, which

lasted till late in spring, the first fine warm day we had occurring on the 29th of April; another cause may have been the unprecedented drought of the summer of 1874, which materially interfered with the growth and flowering of many plants, thereby causing a great falling off in the quantity of pollen and honey, both of which are essential for food for the larvæ of the bees: still another fruitfull cause of their scarceness was, no doubt, to be found in the prevalence of North and East winds, and sometimes the two combined; cold winds or dull weather are very prejudicial to these insects, they will not stir from their burrows while either prevail, should a cloud even pass between them and the sun, they will remain quiet on whatever flower they may happen to be, till it is passed, and if of long duration, they seem to fall into a deep sleep, or to be almost entirely numb.

In consequence of the cold Spring, all vegetation was backward, but when it did burst into bloom, and sunshine came, the early bees which had been retarded by the cold, swarmed in some species: amongst them was the hitherto unknown female of *Andrena bimaculata*, a beautiful insect belonging to the division with red or partial red abdomens, the male was named by Kirby who took it twice at Barham. Mr. Smith says in his book there are only two specimens known, and these are in the collection of the British Museum; I was fortunate enough to take a few males on Mousehold three years ago, this year they literally swarmed, not only on Mousehold, but all round Norwich. This species seems to be free from the attacks of the parasitic *Stylops*, I suppose I handled over a hundred, but not one of them had a Stylops, although they were in abundance in *Andrena atriceps* and *convexiuscula*, both of which insects were found in the same place, at the same time.

Another *Andrena* was found in tolerable plenty at the sallows, the male and female of this bee greatly resembles the same sexes of *Andrena dorsata*, an insect not uncommon at the flower of the Bramble during July and August; no bee like this latter, has yet been recorded, that I know of, as having been captured in the early Spring. Mr. F. Smith has identified this as *A. combinata* of Kirby, at one time thought to be a variety of the former insect,

Kirby unfortunately frequently omitted to give the date of capture, which has in this and another instance given rise to a slight confusion of species. I have not troubled you with a more lengthy description of these insects, because Mr. Fredk. Smith is preparing a second edition of his catalogue of British bees, and it will then be done by a far abler pen than mine, and what is more important, correctly so. With these, at the Sallows, the rare *Andrena smithella* was not uncommonly found.

At Brundall, in the middle of April, I took a *Nomada*, which, I believe, is new to Britain it is not much unlike *N. lateralis*, the latter, however, occurs about a month later: I am sorry to say the rough bank on which I found the two specimens (females) is now cut away to make a railway siding. Though these species of *Andrena* were plentiful, many of the early ones were hardly represented, of *A. gwynana* and *parvula*, which generally abound on the first fine day towards the end of March, scarcely a specimen was to be found. Kirby divided those little bees into three species, *parvula*, *nana*, and *minutula*, but recent writers have considered *parvula* as simply a variety of *minutula*; this appears to me to be an error, probably caused by the absence of a record of dates of the appearance of these species of *Andrena*. This genus as I have before observed, has, as a rule, but one brood in the year, and the three species appear successively commencing with the earliest day of Spring and continuing to the end of August; the black faced male appears with *parvula* at the end of March or beginning of April, and lasts till about the end of May; in the middle of May are to be found white faced males, and the female *nana*, and at the end of June or beginning of July, there is another white faced male, which differs from the previous one, and with this male appears a female, which at first sight, might be mistaken for *parvula*, but, as Kirby says in a foot note, the abdomen is of a different shape, and it is less hairy; these three species being found in abundance close to the city, have enabled me to get a good series with the dates of capture, and a close examination of these, has led me to believe that Kirby was right in his belief of the three species.

Amongst the early bees is found one, whose habits are veiled in mystery, it is a bee without the necessary hirsuties for conveying pollen; these are invariably absent in the parasitic bees, but it does not necessarily follow that all bees without these appendages are parasitic, for example: the genus *Prosopis* or *Hylæus*, is entirely without them, but are, nevertheless, constructive bees; the parasitic bee lays its eggs on the honey and pollen collected by another bee, when it finds one suited for its purpose; many of these parasites are constant in their attacks on certain species of constructive bees, others (of which perhaps the best example is *Nomada ruficornis)*, attack several species varying greatly in size, and consequently in the quantity of honey and pollen they collect for the future young; the *Nomada* vary in size according to the species they attack, the size being influenced by the quantity of food; the above mentioned insect varies from three to six lines; as a rule there is not a great variation in the size of the constructive bees, but amongst the *Sphecodes* there is just the same variation in size as there is in the *Nomadæ*; these insects are generally found running or flying about the dry banks infested by the *Halicti*, which in the different species, vary as much in size as the specimens do in the species of *Sphecodes*.

And it is not *Halictus* only that *Sphecodes* attacks, (that is supposing it to be parasitic) for in May last I found a large colony of *Andrena albicrus*, which had made their holes in the hard ground by the side of a road, and flying about the burrows, were several large specimens of *Sphecodes rufescens*, busily hunting about the burrows, the entrances to which were not exposed, but each was covered by a little heap of dry dust, which is pushed out by the insect when forming the hole; presently I saw a female *Andrena* turn its head downwards into one of the little heaps of dust, as they did when they wanted to enter the burrow; at the same instant up flew a *Sphecodes*, and by tugging at its legs and wings, tried to pull the *Andrena* out, which at last, I suppose annoyed by the persistence of the *Sphecodes*, turned out and flew away, when the latter quartered the ground in all directions, as if searching for some thing it had lost, and not being suc-

cessful prepared to fly away, when I captured it; these *Sphecodes* were large and fairly corresponded in size to the *Andrena*, but there were no small ones about, and as far as my recollection goes, I have not found large *Sphecodes* without finding large *Halicti* or *Andrenæ* in its vicinity, and small *Sphecodes* without small *Halicti*; of course this may be only a coincidence, although I think it is more than that. Mr. Smith tells me he has seen them burrowing; this certainly goes far to prove that they are constructive bees, but still my opinion is, that they are not so.

In the early Spring, I was struck with the enormous quantity of female wasps that were met with in every direction. This was not confined to this district; as many correspondents to the Gardeners' periodicals noticed the same thing; one of them, who signs himself "P. Grieve, Bury St. Edmunds," writing to the Gardeners' Chronicle of June 19th, says "it has been his duty for the last 28 years to count the slain wasps and hornets, for which one penny each is given, up to the end of the month of May; this season the numbers reached the enormous quantity of 2,566, and the sum paid for them was £10 13s. 10d.; about 5 or 6 per cent. of them were hornets, the numbers captured during former seasons has varied from 500 to 600 up to the unprecedented number of the present season." Several others have given statistics of numbers killed or paid for, all proving that the number of these insects has been enormous. The nests, however, in this neighbourhood, as far as my observation has gone, were not so plentiful as I expected they would have been, many of the females must have been killed by the cold wet weather which occurred during the Spring and Summer.

The leaf cutter bees which make a thimble of pieces of leaves for their nest, and then close the entrance with circular pieces after having put in a sufficient mixture of honey and pollen, are said by Shuckard to fix the circular pieces in and hold them in their places by slightly springing them, but in a cell I examined of *Megachile maritima* the pieces were certainly cemented in their places round the edge with a substance which looked like wax laid on very thinly, but still clearly perceptible.

At Brundall at the end of July, I had the good fortune to take

another male specimen of *Macropis labiata*, it was at the little thistle; this makes the fifth specimen taken in Britain, which are all males, and I think without doubt, establishes this as the locality for the one Mr. Brown took last year; there is hardly any doubt but that the female will yet be taken there, if looked for. At the same time and place I took two females of the rare *Nomada xanthosticta*; the bad weather which prevailed at the time, most likely had something to do with my not taking more of either species; the day I took them the sun shone for full half an hour, when as usual, a storm came on and I got instead of more insects, a wetting. *Andrena decorata* again abounded at the flowers of the bramble in this neighbourhood, and though most plentiful, the red variety were very scarce indeed, nearly all being dark.

Bees seem very uncertain in their appearance, in some seasons certain species appear in numbers, and the next season none or next to none are to be found anywhere. *Nomada jacobææ* abounded last year whilst this year I did not see a single specimen. *Andrena smithella* was tolerably abundant this year, and before I had only taken a single female. Bees are only to be found during the really fine weather of Spring, Summer, and Autumn, when the country is in its loveliest state; and the situations it takes one to, are the most attractive, where the wild flowers bloom the most freely; can anything be more delightful than to find one's self in such a place, the air laden with the perfume of many flowers, and alive with these industrious little creatures, many of them humming over their work with as much variation in their notes as there is in an Eolian Harp, (I say many of them for some are silent flyers,) their hum on such occasions as these is the contented hum of a self satisfied bee, but they have far different notes to these, just disturb them, and they will sometimes fly about one's head, with an angry, shrill, piping note, then again, take them in your fingers, and they will emit quite a piteous whine; some, instead of the easy, comfortable drone, hum with an eager, restless note, as if they thought every minute ought to have ninety seconds instead of sixty, and all intermediate notes may be heard.

The flowers I have found most frequented by bees are willows, sallows, blackthorn, dandelions, veronica, sycamore, brambles, thistles, ragwort, hawkweed, heath, and the umbelliferæ.

In conclusion, should any feel inclined to study this very interesting branch of natural history, I shall be most happy to render them any assistance that lies in my power.

I.

AN ACCOUNT OF THE SEVERE WINTER OF 1739–40, AND OF ITS EFFECTS IN THE COUNTY OF NORFOLK IN THE YEAR FOLLOWING.

Extracted from the Journal of ROBERT MARSHAM, F.R.S., *of Stratton Strawless, (now in the possession of the* REVD. H. P. MARSHAM, *of Rippon Hall,)*

BY THOMAS SOUTHWELL, F.Z.S.

Read 26th May, 1875,

"The winter of 1739 and spring of 1739–40, was uncommonly severe. The cold began very early; ye 5th of November it began to snow and freeze; which frost continued for a fortnight; and ye ice wou'd bear a man. Y^e 25th of December at night, or ye morning of ye 26th the very severe season began; with a strong easterly wind, and sometimes a little snow. ye 28th, 29th, and 30th, viz., Friday, Saturday, and Sunday, one could hardly bear ye air. The 30th ye thermometer sank below all ye marks, [This thermometer was mark'd down to 7 below Farenheit's freezing point of 32, so this was below 30 of Farenheit,]* and ye Water and Beer froze all Day in ye Hall at Stratton whilest a large wood fire was kept blazing, and ye urin in my chamber-pot froze to a Cake under my Bed four nights successfully, viz., from ye 27th, and from that Day to ye 8th of January inclusive, ye urin froze. The ice was near two inches thick in one Night in a well at Haynford, and near six Inches thick on ye Heath ye first week. During ye severity of ye weather I found ye Water pour'd out of a Bottle upon my Window (ye casement shut) froze almost instantaneously. In five seconds 'twas Ice. After ye 8th of January ye cold abated a little, but on ye 23rd, 24th, 25th, 26th, and ye fore part of ye night of ye 27th it froze in ye House; then ye Cold abated, and on ye 30th, 31st, 1st and 2nd of February, it thaw'd in ye Day, tho' on ye 1st at Night, it froze extremely sharp; 3rd and

* This is evidently added subsequently.—T.S.

4th frosty; 5th and 7th it froze again in ye House. In pouring a mug of Water into a Bason it Ic'd instantaniously; 8th, 9th, and 10th the Cold abated, and some Snow fell, tho' it froze on ye 9th and 10th in ye night; 11th and 12th more Snow fell, so that ye Earth was cover'd again, yet in ye morning of ye 12th I found ye Water in my Bason was Ic'd, and ye same on ye 13th, 14th, and 15th; and on ye 13th ye chamber-pot froze; 16th thaw, but in ye morning of ye 17th there was thin Ice; 18th, 19th, 20th, and 21st frost and Snow; 22nd thaw; 24th and 25th it froze, with a strong east'ly wind; 26th and 27th froze a little, and ye Ice still strong enough to bear, yet I now found the Larks, Thrushes, &c. sing, and ye Rooks began to build; 29th at night it froze sharply, and on ye 2nd March ye Ice bear my walking upon it. I began skeating on ye 19th of January, (and might have done so three weeks sooner,) and did not miss a Day till ye 12th of February, and skeated on ye 25th and several Days between ye 12th and 25th, all ye same Ice from ye 25th of December to ye 2nd of March, when it wou'd bear. Tho' ye ice now Daily wasted, yet ye season continu'd cool; ye 7th, 11th, and 12th of March it snow'd, and on ye 13th most of ye earth was white; and on ye day before, viz. ye 12th, ye ice was not quite gone, from ye Christmass when it began, viz., 79 Days, 11 weeks, and 2 Days Ice. Nor did ye Snow (which fell plentifully ye beginning of January) melt entirely till ye Frost ended.

"As this was the severest season I have known, I was glad to gain any accounts of it in other parts of England. The following one was given me by my Friend Partridge, as made by himself in London; a Gent. of undoubted veracity. I shall transcribe his words. 'Some Particulars of the hard Frost in 1739, as observed in London; and of its effects in the Country the year following. Tuesday, December 25th, 1739, was a wet, mizzling Day; in the afternoon I walked in St. George's Fields, and observed the weather to clear up and grow very cold; at night it began to freeze, and continued freezing all Wednesday and Thursday; Friday, Saturday, Sunday, and Monday, and Tuesday following were excessive cold Days; by Saturday the Thames was so clogged with Ice that no boats could pass; and there were great Quantities of Ducks, Teal, and other Wild-fowl upon the River, so tame by the Severity of the Weather, that several were shot from London Bridge, and the Houses next the Water; Sunday and Monday it snowed

much, wh it had not yet done. Wednesday, January 2nd. It thawed very much, but at Night froze again, and the Frost continued very severe, tho' the Wind changed several times, almost round the Compass, and altho' it continued W. and S. for ten Days together, Tuesday, January 29th, the wind coming to N.E., still very cold; the Thaw began in London, and continued gradually several Days, the wind still in the same corner, and freezing a little at Night, but this carried off all the Snow near London. Sunday, February 3rd, it thawed much all Day, and the Beginning of the Night, but towards Morning froze very sharp; so it did on Monday Night, and all Tuesday. Wednesday, February 6th, it thawed pretty much in the Day and Evening, Wind still N. and N.E. Thursday Morning it froze, and continued freezing very sharp all that Day and the following night; Friday Morning the Wind was S.W., still excessive sharp Frost, at Night Wind a little to the North, and a very hard Frost; Saturday, Wind W. and N.W., still a very hard Frost; towards the next Morning some sleet: Sunday very cold, Wind high at West, with mizzling Rain about Noon and in the Evening; in the night a great deal of Rain; Monday Morning still thawing, tho' Cold, wind W. and N.W., frequent cold, with Showers all the day and thawing a pace till after Midnight; Tuesday Morning a very sharp frost, Wind N., very cold all Day, with some Snow; very hard Frost at Night and all the next Day, Wind high at N., extremely cold, some Snow, and very hard Frost at Night; Thursday and Friday very cold, and hard Frost. Saturday, February 16th, a fine, pleasant Day, wind W. and S.W., but thawing only in the sun; Sunday mild air, and thawing; Monday the same, Wind S.W., and a little Frost at Night; Tuesday a fine, pleasant Day, still thawing, Wind W. At night wind high at N.W., with Snow; and on Wednesday Morning, the 20th, a sharp Frost. It continued thawing every Day, and freezing every Night a little, till Tuesday Night, the 26th February, when there was no Frost at all.

"'So the Duration of this Frost might properly be sd to be from Tuesday Night, December 25th, to Tuesday, February 26th, nine Weeks.

"'In London Coals were sold at £3 12s. per Chald., and 10s. was usually pd for Carr. of a Ch. of Coals, if not above a mile; the Hackney Coaches drove four Horses, so did the Carts, and the latter [former?] had double Fares all the Time. I saw in Fleet

Street, near the Castle Tavern, an empty Brewer's Dray stuck fast, and tho' it had five Horses, it was a long while before they could move it. In several parts of London, where were the greatest Thoroughfares for Coaches, particularly near Temple Bar, the Dirt of the Streets, then consisting of Snow, Mud, Ice, &c., all froze together, was ground by the Wheels to a fine Powder, and would get into the Shoes like Sand, and was hardly perceptible till a Man came to sit still within Doors, and then he should find himself wet shod.

"'After the Frost was gone, there came a few fine, warm Days; but about the 7th of March, (when I sett out for Norfolk,) the Wind settled at N. and N.W., blowing very hard, and continued so with little or no variation, till the 17th of April, during w^h^ Time the Weather was very cold for the season of the Year, no Rain, and generally a sharp Frost at Night. About the 17th of April the Wind came to W., then S.W., and there fell a great deal of Rain in many places; but in the open parts of Norfolk there was only two or three Hours' Rain on the 20th, in the Morning; about Noon the Wind came N.W., and then N., and the next Morning by four it began to Snow, and before Night there fell more Snow at Northwold than had done all the Winter, the Wind blowing very hard at N. and N.W. On the 22nd and 23rd there fell a great deal of Rain, the Wind still high, and in the same corner. Soon after it settled at E. and N.E., and continued so with little change till the middle of June; the Weather, especially at Night, very cold all the while, and little or no Rain.

"'The effects of this hard Frost, and the following cold Weather and Drought, in the open parts of Norfolk were, that all the Turnips were absolutely destroyed; the Winter Corn in the fields and in many other places appeared to be almost killed, so that many Farmers in divers parts of the kingdom, despairing of a Crop, plowed their lands for Barley; but the event showed they were greatly mistaken in their judgment, for the Crop of Winter Corn, particularly in Norfolk, proved as plentiful as ever was known; never were seen larger ears or finer Grain. The flocks in the Champaign Country, and in most other places, were half destroyed, and most of the Lambs died, purely for want of Sustenance, there being no Grass at all, either in the Meadows or on the Heaths, and many of the Rabbitts in the Warrens were starved; the Furze and Ling were killed; and in this present Year, 1744, there is scarce

any appearance of Furze, even in places wch were strong Fox-covers, except where they were burnt in the Spring after the Frost.

"'About the beginning of May, 1740, Wheat in Cambridgeshire sold for 8s. p. Bushel; Rye in Norfolk for 5s. p. Bushel, just before Harvest; and in July stinking Norfolk Barley sold at Bear Key for 27s. 6d. p. Quarter. In the beginning of the Winter Wheat was worth 10s. 6d. p. Bush. in Bristol, and 12s. in Herefordshire, Monmouthshire, &c., where the Crop quite failed. And for the Honour of Norfolk, corn continued in that County much cheaper after Harvest than in any part of England, altho' it was exported from all the Ports as fast as they could load it on Shipboard, for Holland and France, till an Embargo was laid on Foreign Exportation, about Christmas; and then the Exportation continued near as brisk for the West and the North, but the prices abated, so that Norfolk that year was really the granery of England.'

"So far Mr. Partridge: but he forgets to mention the Thames being quite froze, so that thousands of people walk'd cross it for Days. It seems the wind being so high during ye beginning of ye Frost, drove ye pieces of Ice (which were broke by ye flow of ye Tides for a day or two) up in heaps, so that ye River of Ice appeared like ye sea when rough.

"Beside ye extreme backwardness of ye season, there were many bad consequences from ye last hard Winter. The Frost split vast numbers of Trees, both Timbers and Pollards. I put 6, 7, and 8 Shillings together into ye clefts of Oaks and Chesnut Trees; and into one Chesnut (a thriving, fine tree) I put ten Shillings, viz., very near half an Inch. The Furze were mostly destroy'd, and ye Broom almost entirely in open and exposed places; the sweet Bays, Laurels, Laurastinas, &c., and also Artichokes, Sage, and many other Shrubs, wither'd; but if cut down, many of them shot again from ye Root. The ivys growing against trees, &c., were destroy'd on ye E. side, and living on ye S. and W. The Winter Corn on ye S. side of ye Ridges, where ye snow was melted, was mostly very thin and bad, and in some parts quite destroyed. I was told at Hereford that ye Farmers in that County had not so much wheat to reap as they sow'd, and that ye poor were almost starv'd. Wheat was 30s. p. Comb ye next Spring in Norfolk, yet it was cheaper here than in any other parts of England. With ye high price of provision in general, the Weavers in Norwich, and some idle people in y^e^

Country, rose in riotous manner, and did some Damage in Norwich and ye Neighbourhood, for which some were hang'd at ye next Assizes."

NOTE. See Mr. Marsham's M.S. "Journal," pp. 11 to 21, and 24 and 25. Mr. Partridge's account of the Winter in London, &c., is copied from his own M.S., which is placed between the pages of the "Journal," (loose) and not from Mr. Marsham's transcript of it in the pages of the book.—T. S.

II.

FUNGI OBSERVED ON THE OCCASION OF THE SOCIETY'S EXCURSION TO SCOULTON MERE ON JUNE 23RD, 1875.

BY CHAS. B. PLOWRIGHT.

Read 29th June, 1875.

During the excursion of the Norfolk and Norwich Naturalists' Society, on Wednesday, June 23rd, 1875, to Scoulton Mere, although some fifty ladies and gentlemen, members and friends, took part in it, there was present, I believe, only one individual of mycological propensities. This is much to be regretted, especially as the district in which the Society works is one admirably adapted for this branch of field work, and it is, moreover, one rendered classical by Sowerby, who made more than one excursion to Norwich before publishing his standard work. It is needless to say anything about the interest *per se* of mycology, save only that it is a subject which can be worked at all seasons of the year, and one to which men of science look for the solution of more than one problem of vital interest to the community.

The total number of fungi met with upon this occasion was not large, but this arises not so much from any paucity of fungal forms as from a sparseness of searchers: only one pair of eyes was engaged in investigation, every inch of the county being new to the observer. Other objects than fungi were gazed at; of course the mere, the island, the gulls, the flowering plants, and a

hundred other objects came in for more than a casual glance. Notably we observed *Villarsia nymphœoides*, *Lysimachia vulgaris*, *Lastrea cristata*, *Osmunda regalis*, *&c.*, with special interest.

I was struck, both on the journey from Norwich to Scoulton, and also from Swaffham to Norwich by rail, with the large number of ears of corn affected with *Ustilago carbo*, Tul.—smut. In marshland, (*i.e.*, Terrington St. Clement's,) I had previously noticed the same condition of things, but in the vicinity of Lynn, especially upon the light lands, few, if any, diseased ears were observable. Mr. James Bedingfeld had also observed the number of "smuts" in the vicinity of Norwich. Viewing the matter in a practical light, one is naturally led to ask what is the cause, and here we find an instance of the fact that *moisture* alone is not the essential for the production of fungal life; hitherto the season has been decidedly "dry," indeed agriculturalists—a somewhat unusual circumstance with them—have been almost *grumbling* with the season on account of the lack of rain, and yet we find the *Ustilago* more than commonly plentiful.

There were no less than fifteen species of the larger Pileate Hymenomycetes met with, which, considering the early period of the year, was unusual.

The Fungi found were :—

1. AGARICUS (AMANITA) VAGINATUS. Bull. Two young specimens growing at the edge of the Mere.

2. AGARICUS (AMANITA) RUBESCENS. Pers. In company with the preceding.

3. AGARICUS (MYCENA) ALCALINUS. Fr. Under fir trees.

4. AGARICUS (PLUTEUS) CERVINUS. Schœff. Nearly opposite the Gullery: several fine specimens, the largest 3 or 4 inches in diameter. When gathered the gills were quite white, and only became rosy the following morning.

5. AGARICUS (HEBELOMA) SCABER. Mül. Several specimens under beech trees.

6. AGARICUS (HYPHOLOMA) FASCICULARIS. Hud.

7. LACTARIUS RUFUS. Fr.

8. LACTARIUS SERIFLUUS. Fr.

9. RUSSULA VIRESCENS. Fr. At least this is the only species to which I can refer the specimens found; they were far advanced, and had lost all traces of any virescent hue.

10. Russula rubra. Fr. ?

11. Marasmius peronatus. Fr. Growing side by side with the next.

12. Marasmius oreades. Fr. Abundant.

13. Boletus æstivalis. Fr. A young specimen; also found near Lynn this year, not previously recorded in Norfolk.

14. Polyporus squamosus. Fr. On a stump.

15. Polyporus versicolor. Fr. On a sycamore stump.

16. Grandinia granulosa. Fr. Abundantly on fallen fir branches.

17. Phallus impudicus. Linn. Abundant in several places, found first by its odour. While passing the Earlham woods, on the road home, a young lady was heard to exclaim, *con spirito*, "Oh that horrid fungus!" The plant in question could not have been less than twenty or thirty yards from the vehicle, and nothing had been said to direct attention specially to it, yet so powerful was its odour as to be perceptible even at that distance.

18. Lycogala epidendrum. Fr. On an ash stump.

19. Æthalium septicum. Fr.

20. Puccinia pulverulenta. Grev. On *Epilobium hirsutum*.

21. Ustilago carbo. Tul. On wheat and barley: apparently most abundant on the former.

22. Ustilago salveii. B. and Br. On *Holchus lanatus*.

23. Æcidium rubellum. Pers. On water dock.

24. Ceratium hydnoides. A. and S. Abundantly.

25. Helminthosporium rousselianum. Mont. On beech sticks.

26. Peziza cupularis. Linn. A single specimen.

27. Peziza virginea. Batsch. Everywhere.

28. Peziza calycina. Schum. On larch.

29. Peziza cinerea. Batsch. On dead wood.

30. Hysterium arundinaceum. Schrad.

31. Xylaria polymorpha. Grev. Conidiate state.

32. Xylaria hypoxylon. Grev.

33. Xylaria carpophila. Fr. Abundant and very fine.

34. Sphærella rumicis. Dez. On living dock leaves.

III.

THE CORRESPONDENCE

OF

ROBERT MARSHAM of *Stratton-Strawless*, in the County of Norfolk, Esquire, and Fellow of the Royal Society;

AND

The Reverend GILBERT WHITE, of *Selborne*, in the County of Southampton, Master of Arts, and Fellow of Oriel College in the University of Oxford.

1790—1793.

Communicated by the Rev. H. P. MARSHAM, and Prof. BELL,

September 28th, 1875, *and March 1st*, 1876.

[The following correspondence, between ROBERT MARSHAM and GILBERT WHITE, hitherto unpublished, is printed *literatim et verbatim* from the original letters in the possession of the Revd. H. P. Marsham and Professor Bell,—the former a great-grandson of the one writer, the latter the present occupant of GILBERT WHITE'S house and entrusted with the use of such of his papers as are known to exist.

To the kindness of the Rev. H. P. Marsham of Rippon Hall, near Norwich, the Society, already indebted for a series of extracts from the valuable records kept by his ancestors (*Transactions*, vol. ii., pp. 31—45 & 125—130), now owes the privilege of laying before its members and the public generally, the interesting memorials, (forming half of the present communication,) of one whose name has been so long endeared to every British Naturalist —GILBERT WHITE.

To Professor Bell, in like manner, the thanks of the Society are equally due for his courtesy in permitting the letters of a Norfolk

worthy—ROBERT MARSHAM—to appear in the present publication, so as to complete, so far as it is known to exist, the correspondence of those two eminent men and thorough lovers of Nature.

Of GILBERT WHITE it is needless here to speak, but attention may be called to the fact that the last of the letters now printed must have been nearly, if not quite, the last of those delightful essays on Natural History which he ever penned. It closes with the ominous words:—"The season with us is unhealthy." They were written on the 15th of June, 1793, and the writer died *eleven* days afterwards.

Though far less celebrated than his contemporary and correspondent, ROBERT MARSHAM is already known to most readers of WHITE'S posthumously published writings as one to whose opinions the latter often referred in terms of respect. Born the 27th of January, 1708, MARSHAM began to shew early in life a fondness for arboriculture, as his descendant finds in one of his earliest journals:—"March, 1718.9. The Inclosure N.E. of the House "[at Stratton] was sewd by John Gunner (my Father's plowman) "with oats and acorns (part of my gathering). In winter, 1734 "I measured one of the tallest oaks from these acorns and found it "24 feet 5 inches high. Same time I measured some of the last "year's shoots and found some 3 ft. & ½ & some (that I believe were "only the year's growth) were above 4 feet."

On the 8th of February, 1728, he entered as Fellow-commoner of Clare Hall in the University of Cambridge, as shewn by the admission Book of that College, which its present Master, the Rev. E. Atkinson, D.D., has kindly examined for that purpose.* It does not appear that he ever proceeded to a degree, but the numerous classical quotations in his writings prove him to have been a very good scholar. He subsequently went abroad (in 1737 and 1738) and travelled through France, Switzerland and Italy, amassing

* Dr. Atkinson has also been so good as to point out that the Master of Clare at the time of Marsham's entrance to the University was Charles Morgan, a natural philosopher and an intimate friend of Martin Folkes (himself a Clare man), the President of the Royal Society. These circumstances may have encouraged Marsham's diligent pursuit of observational science, though that he was a naturalist almost from his cradle is evident on other grounds.

much knowledge which he was able to apply in various ways in after time. He succeeded to his father's estate of Stratton-Strawless, some seven miles north of Norwich, in 1751, and from that period he seems to have travelled much in England, particularly where any remarkable trees were to be seen, and as these letters prove he became acquainted with many of the most eminent men of his day. Arboriculture was evidently his ruling passion, and he delighted in making experiments in the growth of trees, the results of which he communicated from time to time to the 'Philosophical Transactions' of the Royal Society, of which he was elected a Fellow on the 9th of June, 1780, and admitted on the 31st of May, 1781. He died on September 4th, 1797.

The "Indications of Spring," of which he left such a remarkable register afforded him annually recurring topics for remark, and the value of his observations on rural subjects may be well estimated by WHITE's exclamation:—"O, that I had known you forty years ago!"

A summary of the 'Indications,' with extracts from Mr. Marsham's Journal have been already printed in these 'Transactions' as above referred to. Begun in 1736 the register has been continued by his descendants with but slight intermission to the present time.

An extract from the first letter of the present series originally appeared under the head of "*Observations on Vegetables*," in White's 'Calendar of Nature,' published after his death by Aikin in 1795; it has since been appended to almost every edition of the 'Natural History of Selborne,' although it formed no part of the original work. This quotation, however, is very inaccurate, as will be seen by comparing it with the literal copy of the original at p. 139.

For the foot-notes appended to the correspondence, as now printed, the Society is indebted to Mr. J. E. Harting and Prof. Newton whose initials are respectively attached to them, and through the intervention of the former the Society is able to give an impression of the wood-cut representing the Grindstone Oak.—T.S.]

LETTER I.

[Marsham to White.]

STRATTON,
NEAR NORWICH.
JULY 24. 1790.

SIR,

I have received so much pleasure & information from your ingenious Nat. Hist. of Selborne, that i cannot deny myself the honest satisfaction of offering you my thanks: & i hope you will excuse the liberty that i have taken.—I have kept a poor imperfect journal above 50 years; but it has been chiefly confined to the leafing & growth of Trees; & was undertaken by the advice of my most estimable friend the late Dr Hales.[1] By that i find

[1] A memoir of Dr. Stephen Hales, extracted from Butler's 'Memoirs of Bp. Hildersley,' with an engraving from an original portrait, and a fac-simile of his handwriting, will be found in the 'Gentleman's Magazine' for Jan. 1799 (p. 9). Born in 1677, this celebrated philosopher and divine was the grandson of Sir Robert, and brother of Sir Thomas Hales, Bart., of Bekesbourne, in the Co. of Kent. Educated at Corpus Christi College, Cambridge, where he was admitted a Fellow in 1702, he was appointed first to the cure of Teddington, then to the rectory of Porlock, in Somersetshire, and ultimately, in 1722, to the rectory of Farringdon, near Alton, the adjoining parish to that in which Gilbert White resided. In addition to a treatise on 'Vegetable Staticks,' which was translated into French by Buffon, as well as into Italian, German, and Dutch, and a practical work on 'Ventilators,' he indited numerous sermons and tracts in the cause of temperance, and published several scientific papers in the 'Philosophical Transactions' of the Royal Society, of which learned body he was elected a Fellow in 1717. In the sixth letter of the present series it will be seen that allusion is made in some detail to the philosophical pursuits in which he was wont to engage. He died 4th Jan. 1761.

The family of Hales was originally seated at Hales Place, in Halden, Kent, whence they were usually called 'at-Hale.' Nicholas at-Hale, or Hales, lived there at the latter end of the reign of Edward III. See Hasted's 'History of Kent,' vol. ii, p. 576, (1782) and vol. iii, p. 716, (1790).—J. E. H.

that Linnaeus's Disciples, & their followers, are mistaken in their supposed rule of Nature, *that all plants must follow in order.* For you see by the Indications of Spring in the last Vol. of the Phil. Trans. which very imperfect as it is, the R. S. did me the honour to print, there are reverses of many days.

Sir, i was much pleased with your Poetry in the Sum^r. Evening walk.—I hope you will excuse my asking you some questions for my information. The copulation of Frogs as you describe,[2] is the manner of Toads with us: & i never saw Frogs so engaged.

By your account of the Swallows on the 29 of Sep. 1768, i presume that you believe in their migrating: & there are very strong reasons to believe so of some other Birds. Many Woodcocks are found by the Light-houses in Norfolke in the Autumn, that are kill'd by flying against the Lights: & the Earl of Orford[3] informed me, that the Landgrave of Hesse sent him a ring taken from the leg of an Heron, with Ld O. name upon it. This is certain proof of the Heron's going from England: & myself have seen (coming from Holland) a Wagtail (Motacilla alba) flying about the Ship, seemingly at ease, when out of sight of Land. These, without Admiral Wager's,[4] Adanson's,[5] & Smith's,[6] (the earliest account that i recollect in print) are sufficient for migration: & the proofs for torpidity are also undoubted. So we may conclude

[2] See Letter XVII to Pennant.—J. E. H.

[3] George Walpole, grandson of the great Sir Robert, succeeded his father as third Earl of Orford in 1751, and died in 1791. He was a celebrated falconer, but is perhaps better remembered from having sold the valuable collection of pictures at Houghton to the Czarina. At his death the title passed to his uncle the well known Horace Walpole.—A.N.

[4] The evidence of Admiral Sir Charles Wager, sometime First Lord of the Admiralty, was first published by Collinson in 1760 (Phil. Trans. li. p. 461), and has been often reprinted.—A.N.

[5] 'Histoire Naturelle de Sénégal, &c. Par M. Adanson.' Paris: 1757 pp. 67 and 90. Reference is again made to his observations further on. They have been frequently quoted.—A.N

[6] The reference here is probably to a passage in 'A Natural History of Nevis, and the rest of the English Leeward Charibee Islands in America, &c. In Eleven Letters from the Rev^d. Mr. [William] Smith, &c., Cambridge: 1745.' Writing of Nevis and St. Christopher's, the author says (p. 51) "at the Sun's declension towards the Tropick of Capricorn from the Equator, we are visited by a few Swallows."—A.N.

they are both true. But the annual increase in the Swallow tribe, which are lost in Winter affords unaccountable difficulties to be cleared. I have had 4 pair attending my house as many years as i can remember. If these produce two broods of 5 young, you see, Sir, one pair only, will in 7 years produce above half a milion, 559870 birds: yet the number every Spring appears the same. If both broods are destroyed, surely the old birds would be lessened by accidents, so as to be perceptible. If the early, or the latter brood is preserved, you see the next Spring Birds will be as 5 to 2, if all the old Birds are lost: & i never heard that Swallows are increased in any part of the Globe. We know that all the carnivorous Birds drive off their young as soon as they are able to provide for themselves; & i conclude that fish-eating Birds do the same: for when i was on the charming Lake of Killarny, i was told that was the case of a pair of Ospreys,[7] that yearly nested on an Island of Rock in that Lake. But we cannot suppose the Swallow tribe can fear the want of provision. S^r^, you know the Fern Owl is one of the Spring Birds, & appears here as the latest comer. I used to have many in my Woods; but since the long & severe Winter of 88 i have had very few. Is not this a presumptive proof of their torpidity? & that they were destroyed by the severity of that Season?—Your account of the 26 & 27 of March in 1777 was felt here in Lat. 52.45°. but no Swallows appeared. The 27th. was insufferably hot, with a S. W. Wind; which changed in the afternoon to N.E. with a thick Sea-hase, & my Therm^r.^ sunk above 20 degrees in 3 or 4 hours. The greatest change i have ever observed.—I find in 1776 Jan. 31. your Therm^r.^ sunk to 0. mine of Farenh^t.^ was at 16. & in 1784 Dec. 10. when your Dollands was 1. below 0, mine was but at 10. The coldest Air I have measured was Jan. 19. in 1767. when it was down to 1. I take the liberty to tell you this, as it possibly may be entertaining to you to see the difference of less than 2 Degrees of Lat.

Sir, when you print a 2^d^ Edition, (which the merit of your Book

[7] The name "Osprey" seems to have been formerly applied to the Sea-Eagle *(Haliaetus albicilla)* as well as to what is now known as the Osprey *(Pandion haliaetus)*. Thompson states (Nat. Hist. Ireland, i. p. 29 note) that no proof of the latter's building either at Killarney or elsewhere in Ireland had to his knowledge yet been recorded, and it is therefore likely that the species spoken of in the text was the former.—A.N.

will certainly soon demand) i hope in your description of the Holt Forest, you will pay a compliment justly due, to the Oak by Ld Stawel's Lodge: as i suppose it the largest in this Island. I went from London on purpose to see it in 1759, and again occasionally in 1778. 'Tis at 7 feet full 34 feet in circumf. & had not gained half an inch in 19 years. yet i could not see it was hollow. If i measure right, i make 14 feet length of the Holt Oak, to contain above 1000 feet, viz above 320 feet more than the Cowthorp Oak, which Dr Hunter in his Edition of Evelyn's Silva,[8] calls the largest in England. I early begun planting, & an Oake[9] which i planted in 1720, is at one foot from the earth 12 feet. 6. inches. 0 round; & at 14 feet (the half of the timber length) is 8.2.0. So measuring the bark as timber, gives 116F. ½ buyers measure. Perhaps you never heard of a larger Oak & the planter living. I flatter myself, that i increased the growth by washing the stem, & digging a circle as far as i supposed the roots to extend, & spreading saw-dust &c, as related in the Phil. Trans.[10]—I wish i had begun planting with Beeches (my favourite Trees as well as your's) & i might have seen large trees of my own raising. But i did not begin Beeches 'till 1741, & then by seed; & my largest is now, at 5 feet, 6.3.0 round, & spreads a circle of + * 20 yards diamr. But this has been digged round & washed, &c.——The last Winter was so very mild with us, that the leaves of many of my very young Oaks preserved their green into April, & a large Hawthorn (headed the preceeding year) has its old leaves now: which i never observed before, in any deciduous trees: tho' I once had a second leafing of a Hawthorn about Xmass. But those leaves faded before Spring, I sent the account to Sr J. Pringle when P.R.S.[11] but he thought it

[8] 'Silva: or, a Discourse of Forest-trees, &c. By John Evelyn. With notes by A. Hunter.' New Ed., 2 vols. 4to, York: 1786. vol. ii. p. 197. The Cowthorpe Oak grew on an estate belonging to Lady Stourton, and an engraving of it is given by Hunter, who introduces his notice of it by a reference to "My ingenious friend Mr. Marsham."—A.N.

[9] This oak will be found noticed in the "Observations on Vegetables," where an extract, very incorrectly printed, from the present letter is quoted—J.E.H.

[10] Vol. lxvii. p. 12.—A.N.

[11] Sir John Pringle, President of the Royal Society, 1772—1778.—A.N.

* This was Marsham's usual mode of expressing "more than" see Trans. Vol ii., p. 39.—T.S.

not strange. Sir, if you do not take the Ph. Trans. if you please i will send you a copy of my Indica$^{n:}$ of Spring, as it may be an amusement to you, to see how much later we are in Norfolk than you are in Hampshire. I am, with great esteem,

Sir, your most obedient
humble servant,
R: MARSHAM.

P.S. I have now in a Stack of Blocks a young Cuckow fed by a water-Wagtail.

LETTER II.

[White to Marsham.]

SELBORNE: NEAR ALTON: HANTS,
AUG: 13TH: 1790.

GOOD SIR,

As an author I have derived much satisfaction from your kind, & communicative letter; & am glad to hear that my book has found it's way into Norfolk, & that it has fallen into the hands of so intelligent, & candid a reader as Yourself, whose good word may contribute to make it better known in those parts. I am glad that You happened to mention your most estimable friend the late Dr. Steven Hales; because he was also my most valuable friend, and in former days near neighbour during the summer months. For tho' his usual abode was at Teddington; yet did he for many years reside for about two months at his rectory of Faringdon, which is only two miles from hence; & was well known to my Grandfather, & Father, as well as to myself. If I might presume to say that what you see respecting the copulation of toads is, I think, a mistake, you will pardon my boldness: because the amours carryed on in pools & wet ditches in the spring time are performed by *frogs*, which are more black & bloated at that season than afterwards. As to toads they seem to be more reserved in their intrigues.

With regard to the annual encrease of swallows, & that those

that return bear no manner of proportion to those that depart;[1] it is a subject so strange, that it will be best for me to say little. I suppose that nature, ever provident, intends the vast encrease as a balance to some great devastations to which they may be liable either in their emigrations or winter retreats. Our swifts have been gone about a week![2] but the other hirundines have sent forth their first broods in vast abundance; & are now busied in the rearing of a second family. Myself & visitors have often paid due attention to the oak in the Holt, which ought indeed to have been noticed in my book, & especially as it contains some account of that forest.[3] You have been an early planter indeed! & may safely say, I should think, that no man living can boast of so large an oak of his own planting! As I had reason to suppose that actual measurement would give me the best Idea of y^r. tree, I first took the girth of my biggest oak, a single tree, age not known, in the midst of my meadow: when tho' it carries a head that measures 24 yards three ways in diameter; yet is the circumference of the stem only 10 ft. 6 in. I then measured an oak, standing singly in a Gent's outlet at about two miles distance, & found it exactly the dimensions of your's. After such success you may well say with Virgil,

"Et dubitant homines serere, atque impendere curas?

In an humble way I have been an early planter myself. The time of planting, and growth of my trees are as follows.
Oak in 1731—4 ft. 5 in. Ash in 1731—4 ft. 6½ in. Spruce fir in 1751—5 ft. 0 in. Beech in 1751—4 ft. 0 in. Elm in 1750—5 ft. 3 in. Lime in 1756, 5 ft. 5 in.[4] Beeches with us, the most lovely of all forest trees, thrive wonderfully on steep, sloping

[1] This observation occurs, nearly in the same words, in Letter XXXIX to Daines Barrington.—J. E. H.

[2] The early retreat of the swift, "so many weeks before its congeners," is a circumstance to which White has frequently alluded. See Letter XXVI to Pennant. Elsewhere he remarks, "they usually withdraw within the first week of August." See Letter XXXVII to Pennant.—J. E. H.

[3] See Letter IX to Pennant, and the "Observations on Vegetables" —J.E.H.

[4] These dates and measurements, with a slight discrepancy, have been published in the "Observations on Vegetables" above referred to.—J.E.H.

grounds, whether they be chalk, or free stone. I am in possession myself of a beechen steep grove on the free stone, that I am persuaded would please your judicious eye; in which there is a tree that measures 50 feet without bough or fork, & 24 feet beyond the fork: there are many as tall. I speak from long observation when I assert, that beechen groves to a warm aspect grow one-third faster than those that face to the N. & N.E. and the bark is much more clean & smooth.[5] About thirty or forty years ago the oaks in this neighbourhood were much admired, viz., in Hartley wood, at Temple, & Blackmoor.[6] At the last place, the owner, a very ancient Yeoman, thro' a blameable partiality, let his trees stand till they were *red-hearted* & *white-hearted* 3 or 4 feet up the stem. We have some old edible chest-nut-trees in this neighbourhood; but they make vile timber, being always *shakey*, & sometimes *cup-shakey*.[7]

As you seem to know the *Fern-owl*, or *Churn-owl*, or *Eve-jar*; I shall send you, for your amusement, the following account of that curious, nocturnal, migratory bird.[8] The country people here have a notion that the *Fern-owl*, which they also call *Puckeridge*, is very injurious to weanling calves by inflicting, as it strikes at them, the fatal distemper known to cow-leeches by the name of *puckeridge*. Thus does this harmless, illfated bird fall under a double imputation, which it by no means deserves;—in Italy of sucking the teats of goats, where it is called *Caprimulgus;* & with us, of communicating a deadly disorder to cattle. But the truth of the matter is, the malady above-mentioned is occasioned by a dipterous insect called the *œstrus bovis*, which lays it's eggs along the backs of

[5] See the "Observations on Vegetables."—J.E.H.

[6] "The oaks of Temple and Blackmoor stand high in the estimation of purveyors, and have furnished much naval timber; while the trees on the freestone grow large, but are what workmen call *shaky*, and so brittle as often to fall to pieces in sawing." Letter I to Pennant.—J.E.H.

[7] This term is explained, in the "Observations on Vegetables," to mean that the wood is "apt to separate in round pieces like cups."—J. E. H.

[8] This account will be found already published in the "Observations on Birds," under the head of "Fern-Owl, or Goatsucker," and as it is in the same words, it is probably extracted from the notes which White had collected for a history of this bird to be published in the Philosophical Transactions of the Royal Society. See the 9th letter in the present series.—J. E. H.

kine, where the maggots, when hatched, eat their way thro' the hide of the beast into it's flesh, & grow to a large size.[9] I have just talked with a man, who says, he has been employed, more than once, in stripping calves that had dyed of the *puckeridge:* that the ail, or complaint lay along the chine, where the flesh was much swelled, & filled with purulent matter. Once myself I saw a large, rough maggot of this sort squezed out of the back of a cow. An intelligent friend informs me, that the disease along the chines of calves, or rather the maggots that cause them, are called by the graziers in Cheshire *worry brees*, & a single one *worry bree*. No doubt they mean a *breese*, or *breeze*, the name for the *gad-fly*, or *œstrus*, the parent of these maggots, which lays it's eggs along the backs of kine.

But to return to the fern-owl. The least attention & observation would convince men that these poor birds neither injure the goat-heard, nor the grazier; but that they are perfectly harmless, & subsist alone on night-moths, & beetles; & thro' the month of July mostly on the *scarabæus solstitialis*, the small *tree-beetle*, which in many districts flies & abounds at that season. Those that we have opened have always had their craws stuffed with large night moths, & pieces of chafers: nor does it any wise appear, how they can, weak & unarmed as they are, inflict any malady on kine, unless they possess the powers of animal magnetism, & can affect them by fluttering over them. Upon recollection it must have been at your house that the amiable Mr. Stillingfleet kept his *Calendar* of *Flora* in 1755.[10] Similar pursuits make intimate &

[9] In letter XXXIV to Pennant, as well as in the "Observations on Insects and Vermes," this insect is noticed by White under the name *Œstrus curvicauda*. At the date of his former letter, March 30th, 1771, he seems to have been unaware that it had been described by Linnæus as *Œstrus bovis* but this impression was evidently altered before the date of the present letter to Marsham.—J. E. H.

[10] This was so. Stillingfleet refers to him as his "very worthy and ingenious friend Robert Marsham," and speaks in high terms of the hospitable treatment that he experienced at Stratton. See the other letters of the present series. The 'Calendar of Flora,' made in 1755 and published in 1761, will be found alluded to in Letter XII to Pennant.—J. E. H.

Benjamin Stillingfleet, the author of this work and of 'Miscellaneous Tracts relating to Natural History, Husbandry and Physics,' was born in 1702 and died in 1771.—A. N.

lasting friendship. As I do not take in the R. S. T.[11] I will with pleasure accept of your present of a copy of y^r. *Indications of Spring*. Hoping that your benevolence will pardon the unreasonable length of this letter on which I look back with some contrition, I remain, with true esteem, Your most humble servant,

GIL. WHITE.

Any farther correspondence will be deemed an honour.

[11] Royal Society's 'Transactions,'—J. E. H.

LETTER III.

[Marsham to White.]

STRATTON NEAR NORWICH.
AUG. 31.-90.

SIR,

I am much obliged to you for your entertaining & instructing letter; & pleased to find that you was acquainted with Dr Hales: and i believe all men that knew him esteemed him. I have had the good fortune to know most of his family.

Sir, i conclude that you are right, & that i was mistaken about the amours of the toad: but so are my acquaintance also. Frogs you know generally leap or jump; now the people we talk of, only walk or creep; and i thought that i had particularly observed their swelled bellies. But if i should live to another Spring, i will examine them with more care.—With respect to the measures of your Trees, i hope we take them at the same height from the Earth viz 5 feet, and then your's and my Trees are nearly equal. Your Oak, i see, gains about 9 tenths of an inch yearly for 58 years, and mine the same in the Grove: but one transplanted from that Grove (which was sowed Acorns in 1719,) gains above 14 tenths, as it was last Autumn 8 F. 3 I. when the largest in y^r. Grove is but 5 F. 3 I. Such is the benefit of transplanting! or perhaps, to speak honestly, the giving as much room as the Tree requires.—I am surprised that your Trees can increase so fast in chalky or stony soil. But perhaps your charming Beech of 50 feet to the head, was not of your own planting. I wish i could

get a peep at it, & make my bow to you; but all the pleasure of rambling is ended with me; I having been lame now near two years, & not once out of the Village in that time. For i have a stony complaint also, which keeps me from a carriage.—Mr. Drake has a charming Grove of Beech in Buckinghamshire,[1] where the handsomest Tree (as i was informed by a friend to be depended on) runs 75 feet clear, & then about 35 feet more in the head. I went on purpose to see it. 'Tis only 6 F. 6 I. round, but straight as possible. Some Beeches in my late worthy friend Mr. Naylor's[2] Park of Hurstmonceux in Sussex, ran taller & much larger; but none so handsome.—Norfolk is too flat a Country to try the difference of the growth of Trees on ye cold or warm sides of hills; but i entirely agree with you in the great advantage of warmth. This County is very ungenial to Elms, which are generally hollow before they are a foot square, & Ash does not thrive with me. I have left off planting Chesnuts; but they grow quick, and i conclude, to the largest size of any Tree in this Island. I have one i raised from the nut, which was 2 feet round at 55 high in 1781. 'Tis a very handsome plant, & holds clear above eleven yards, with a fair head. I have seen several Chesnut-trees above ten yards round; & Lord Ducie's[3] i measured above 15 yards;

[1] Probably at Shardeloes near Amersham.—A.N.

[2] Francis Hare (son of a Bishop of Chichester) was born in 1713 and assumed the name of Naylor in 1734 on succeeding to the estate of his uncle George Naylor, who had bought Hurstmonceaux. In his youth he is said to have been guilty of extravagance and dissipation of every description, joining the notorious "Medmenham Brotherhood." He died in 1775, when the estates passed to his half-brother, Robert Hare, whose grandsons were the accomplished Francis, Augustus, Julius and Marcus Hare. Hurstmonceaux Castle was destroyed by Wyatt in 1777, and now remains a ruin.—A.N.

[3] This magnificent Spanish chestnut at Tortworth, in Gloucestershire, has been mentioned by nearly all writers on trees from Evelyn's time to our own. The particulars of it given in the text a few lines lower down seem to be taken from Ducarel's paper (Phil. Trans. 1771. p. 168), where they are quoted from the 'London Magazine' for 1758 (p. 482). A very fair representation of it, taken in 1824, is given by Strutt (Sylva Britannica, pl. xxix.), and Loudon says (Arboretum Britannicum, p. 1988) that "it may, indeed, possibly have been one of those planted by the Romans." I saw it in August, 1875, and Lord Ducie kindly informs me that its "present girth is about 17 yards; but each measurement will vary, as the trunk is covered with ligneous warts, and a tape may either cover or miss one of these—thus altering its dimensions."—A.N.

which i conclude is the greatest. But i find they cannot bear the severe frosts. I had one of this sort, in the severe Winter of 39–40, split very near half an inch wide, where i could run a table-knife it's length into the crack: but this is quite closed; & covered with bark. To show you the growth of this kind of Tree, i have a memorandum of a former Rector of an adjoining Village, "that he planted a Chesnut Tree by his Church in 1610," which was in Autumn 1788, 19 F. 4 I, or 184 inches in 178 years. I suppose Ld Ducie's Tree may be 1100 years old, if it increased in the proportion reasonable for such a vast Tree; & might be about eleven yards round, in King John's time, as tradition calls calls it the great Chesnut at that time.—Stillingfleet was a very estimable man. I knew him from his first leaving College. Fortune frowned on him from his birth, 'till near his end. He used for many years to visit me. His father, after the Bishop's displeasure, lived on his little Rectory in Norfolk.

Sir, in your 39th letter to Pennant you ask where the Stock-dove breeds? In Norfolk in hollow Trees. The Fern-Owl lays its eggs on the plain Land. I think your Countrymen should be punished for laying so heavy a charge against an innocent Bird. I find a memorandum of mine of so old a date as Sep. 14. 1722 *i shot a ring-Ouzel.* This was the first my father had seen. This shows they are strangers in Norfolk. But i have seen of them twice since, in severe frost. You do me honour to accept my Indications of Spring. To explain to you, i mark leaf, as soon as the smallest leaf appears; and i name the County (if not in Norfolk) as i have observed so near as Hertfordshire, they are sometimes a week earlier than here. You see 'tis shamefully imperfect.—The equal number of the returning Swallows, seems the greatest Mystery, amongst the many Mysteries that attend them.—Sir, as i live in hopes of sometimes having the favour of hearing from you, pray never again make an apology for length; every Article is pleasing to me: but i am unreasonable to wish for so much of your time. I am, with true esteem, Sir,

your most humble
& obliged Servant,
R: Marsham.

P.S. I have had the pleasure of recommending your Work to all

my correspondents.—I know no man in your County, but Mr Chute, the father of your new Member. I congratulate you that Election bustle is over; as i suppose during the contest, ye were as inimical as young Cuckows. I presume you have read Mr Jenner's account of the Cuckow in the Ph. Trans. Vol. 78,[4] he handsomly disculpates the Cuckow of the want of στοργή.—There is a gentleman in this County of the name of Gurdon of good fortune.[5] The family, i suppose for some centuries, has been owners of a Village called Letton. They have lately changed the name for Dillingham.—We have the greatest flight of Swallows i think i have ever seen at this time. I heard the *flying note* of the Fern-Owl on Aug. 20.

[4] '*Observations on the Natural History of the* Cuckoo. *By Mr.* Edward Jenner. *In a letter to* John Hunter, Esq., *F.R.S.* Read March 13, 1788.' Phil. Trans. 1778, pp. 219—237. Jenner, the discoverer of Vaccination, born 1749, died 1823.—A.N.

[5] This remark doubtless has reference to the notice of Sir Adam Gurdon in the 'Antiquities of Selborne' (Letters viii. and ix.). Mr. Gurdon of Letton, High Sheriff of Norfolk in 1789, added to his own surname that of his mother, daughter and heiress of Theophilus Dillingham of Shelton, Beds., and died in 1820. He was succeeded by his son who dropped the second surname. According to Sir Bernard Burke ('Landed Gentry') the Gurdons of Letton are descended from Robert Gurdon (who died in 1343) the second and disinherited son of the above-named Sir Adam by his second wife Almeria or Ameria.—A.N.

[White's answer to this letter is missing.—T.S.]

LETTER IV.

[Marsham to White.]

STRATTON NEAR NORWICH. DEC. 29. 90.

DEAR SIR,

It was not for want of inclination, but want of matter, that i did not offer you my hearty thanks for the favour of your very entertaining letter of the 12th of October. I have very lately met with some intelligence that may afford you some amusement, so wish to lay it before you.

As i knew nothing of Mr Jennor's character, & as some of his

history of the Cuckow is extraordinary, i desired my very estimable friend Lord Suffield,[1] to enquire that of Mr Hunter;[2] he is perfectly satisfied of Jennor's accuracy. He was his Pupil & lived in his house upwards of four years. Jennor sent parts of the account of the Cuckow to Mr Hunter 18 months, or more, before they were published. Hunter has himself repeated some of the experiments, & found them correct: & this last Summer, he put a Blackbirds egg into a hedge Sparrow's nest, & left three of her own eggs; & the Sparrow hatched them & brought them all up. Mr Hunter was not perfectly satisfied, that the ejecting the young sparrows from the nest, was the act of the young Cuckow only, but suspected some aid of the foster-mother: however she & the Blackbird let the young Sparrows enjoy their nest quietly.—Hunter told his Ldp. that he was now making repeated observations upon a species of the Nightingale sent to him from Germany, as a song Bird. Accident led him to suspect, that this Bird could (if one may so speak) see clearly in the dark. His time of frolic is after midnight: he then hops about the Cage from perch to perch, & from the wires of one side, to the other side. Hunter has changed the Cage, & altered the places of the perches, & taken every precaution to exclude every particle of Light; & being shut up in the closet with the Bird, says, he hears him hop from perch to perch, & so on without ever seeming to blunder or mistake. He is almost certain of the fact.[3] I have transcribed Lord Suffield's words that he wrote.—From my own knowledge i can say but little, only, that on the tenth of last November, a Swallow laid dead just under the window of the room i live in; so we must see it the day it fell: & as the last of my Swallows appearing, was on the 30 of Sep. this Bird was most likely in it's torpid state, when some

[1] Sir Harbord Harbord, created Lord Suffield 1786, died 1810.—A.N.

[2] John Hunter, the celebrated anatomist and physiologist, founder of the Hunterian Museum of the Royal College of Surgeons. Born 1728, died 1794. —A.N.

[3] I am not aware of any record of these observations (though doubtless made at the time, according to Hunter's practice) having been published. From the expression used in the text the bird seems not to have been the common species of Nightingale *(Daulias luscinia)*, and if not it was doubtless the "Sprosser" *(D. philomela)* which is common in eastern Germany.—A.N.

accident removed it. The tail was short, so i conclude it was of the latter brood. But although i have had the eaves & roof of my house searched; no bird can be found. Yet it seems unlikely that a single Swallow should hide for the winter when they are so companionable in the Summer, that you very seldom then see a single bird. So i must conclude others are hid near it. On the 17th of this month i had Turnip-flowers; which i find are earlier than i had seen before. Violets have been in flower weeks ago. But i have not marked them in my Indications of Spring. You see Sir, that i began my work very lazily with very few articles. I believe the Elm leaves that you saw at Sunbury on the 20 of Feb. in 1750, were earlier than any i had seen. I find in my journal in 1738. the Elms had leaves on the 23 of March N.S. at Genoa; & on my landing at Antibes the 3d of April, the Rye was in ear.—If it had been my good fortune to know you 50 years ago, i am sure i should have been a wiser, & better man: & i hope 'tis not too late now.—On ye 24th i found a dark Butterfly in my keeping-room, which led me to my Indications: & find the earliest (yellow) Jan. 14 last year. The Season points to me to wish you many more years of health, to enjoy the honest pleasure resulting from your instructing mankind.

I remain, with great esteem, dear Sir, your obedient

& obliged servant,

R: Marsham.

P.S. I think you was poorly paid in 100 shillings for 100 feet of good Elm. The Beeches you mention (tho' hollow) of 30 feet round, are above ten feet larger than i have ever seen.—I had last week an account that there is now in Stonleigh Park[4] (amongst abundance of fine Oaks) an Oak 23 F. 11 Inches round at 5 feet. The Tree is sound & in health.

[Franked by "W. Fellowes," endorsed by White, "Mr. Marsham."]

[4] Stoneleigh near Kenilworth, now the seat of Lord Leigh.—A.N.

LETTER V.

[White to Marsham.]

SELBORNE: JAN. 18TH. 1791.

DEAR SIR,

As your long silence gave me some uneasiness lest it should have been occasioned by indisposition; so the sight of your last obliging letter afforded me much satisfaction in proportion.

I was not a little pleased to find that your friend Lord Suffield corroborated the account of the Cuckoo given by Mr. Jennor, whose relation of the proceedings of that peculiar bird is very curious, new, & extraordinary.—It does not appear from y^r letter that you endeavoured to revive the Swallow, which fell down before y^r parlor-window.—I have not yet done with trees, & shall therefore add, that my tall 74 f. beech measures 6 feet in the girth at two feet above the ground. Beeches seem to me to thrive best on stoney, or chalkey cliffs, where there seems to be little or no soil. Thus about a mile & an half from me to the S.E. in an abrupt field, stand four noble beech-trees on the edge of a steep, rocky-ravin, or water-gulley, the biggest of which measures 9 feet 5 inches at four feet from the ground. Their noble branching heads, & smooth rind show, that they are in the highest vigour & preservation. Again the vast bloated, pollard, hollow beeches, mentioned before, stood on the bare, naked end of a chalky promontory, many of which measured from 20 to 30 feet in circumference! they were the admiration of all strangers. How has prevailed the notion that all old London was built with chestnut? It is with us now vile timber, porous, shakey, & fragil, & only fit for the meanest coopery purposes. Yet have I known it smuggled into Portsmouth dock as good ship-building oak![1]

The more I observe & take notice of the best oaks now remaining in this neighbourhood, the more I am astonished at the oak which you planted yourself. For there is a most noble tree of that kind near Hartely house, which I caused to be measured

[1] In his "Observations on Vegetables" White has remarked, "The timber and bark of these trees are so very like oak, as might easily deceive an indifferent observer. * * * Chestnut sells for half the price of oak; but has sometimes been sent into the King's docks, and passed off instead of oak." —J.E.H.

last week; when behold, at four feet above the ground the girth proved to be only 14 feet, when yours measured 12 ft. 6 in.! Why this fine shafted tree, with it's majestic head escaped the ax (*sic*) thirty years ago, when Sr. Simeon Stuart felled all it's contemporaries, I cannot pretend to say. If you ever happen to see the *Hamadryad* of y^r^ favourite Oak, pray give my respects to her. She must be a fine venerable old lady. For a diverting story respecting an Hamadryal, see the Spectator, vol. 8, p. 128.

Behind my house I have got an outlet of seven acres laid out in walks by my father. As the soil is strong, the hedges, which are cut-up, are prodigious. The maples about 35 feet in height, & the hasles, & whitethorns 20, which, when feathered to the ground, were beautiful: but they now, being 50 years old, have rather over-stood their time; & besides, the severity of Decem^r^ 1784 has occasioned irreparable damages among the branches. Thus much for trees. Lord Stawell[2] has lately sent me such a bird, sprung & shot in his coverts, as I never saw before, or shall again. I pronounced it to be a mule, bred between a cock pheasant, & a pea-hen.[3]

You say wood-cocks in their passage strike against light-houses on y^r^ coast: a Gent. tells me, that at Penzance sea-fowls frequently dash in the night against windows where they see a light.—My well is 63 feet in depth; yet in very dry seasons, as last autumn, it is nearly exhausted: yet you would be surprised to see how few inches of rain falling will replenish it again.[4] How do rains

[2] Henry Stawell Bilson Legge, Lord Stawell, succeeded in 1780 to the barony conferred upon his mother, and died in 1820.—A.N.

[3] This was a hybrid between the Blackcock and Pheasant. It is noticed in the "Observations on Birds," under the head of "Hybrid Pheasant," where the author states that Mr. Elmer, of Farnham, the famous game-painter, was "employed to take an exact copy of this curious bird." The picture was subsequently presented to Gilbert White by Lord Stawell. See Jesse's 'Gleanings,' second series, p. 159.—J.E.H.

It was engraved for 'The works in Natural History of the late Rev. Gilbert White,' (which includes the second edition of 'The Natural History of Selborne') vol. ii to face page 173 (not 123, as the plate is lettered), and is now the property of Professor Bell at Selborne, where I have seen it.—A.N.

[4] Sixty-three feet is stated to be the average depth of the wells at Selborne, which, when sunk to that depth, seldom fail. See Letter I to Pennant.—J.E.H.

insinuate themselves to such depths? The rains this winter have been prodigious! In Novem^r. last 7 inches; in December 6 inches. The whole rain at Selborne in 1790 was 32 inches. Sure such thunder, & lightening & winds have never fallen out within your observation in one winter! Had I known You 30 years ago, I should have been much pleased; because I would have gone to have seen you; & perhaps You might have been prevailed on, when all our timber was standing, to have returned the visit. In the year 1746 I lived for six months at Thorney in the Isle of Ely, to settle an executorship, & dispose of live stock: there I lost nine oxen by their eating yew, as mentioned in my book.[5] I hope you will write not long hence. With the truest respect & esteem I remain,

Your most humble servant,

GIL. WHITE.

The dark butterfly which you saw was the *papilio urticæ:* it is often more early than the yellow *papilio rhamni.* At this moment the Barometer stands somewhat below 28 inches 5 tens! the rain this day has been very great from the S.E.!

[5] See Letter V on the Antiquities of Selborne.—J.E.H.

LETTER VI.

[White to Marsham.]

SELBORNE: FEB. 25TH: 1791.

DEAR SIR,

It was elegantly remarked on our common friend, & my quondam neighbour Doctor Stephen Hales, by one who has written his character in Latin, that—"scientiam philosophicam usibus humanis *famulari* jussit."[1] The observation was

[1] This line was written by Dr. John Burton, and will be found in his '*Opuscula Miscellanea Metrico-Prosaica*' (1771) p. 55. Dr. Burton has himself been eulogized as "a man whose liberality of sentiment always induced him to pay public respect to those whom he esteemed deserving of it." See the 'Gentleman's Magazine,' April, 1780, p. 166.—J.E.H.

just, & the assertion no inconsiderable compliment: for undoubtedly speculative enquiries can bear no competition with practical ones, where the latter profess never to lose sight of utility.

As I perceive You loved the good old man, I do not know how I can amuse You better, than by sending you the following anecdotes respecting him, some of which may not have fallen within your observation.[2] His attention to the inside of Ladies tea-kettles, to observe how far they were incrusted with stone (*tophus lebetinus* Linnæi) that from thence he might judge of the salubrity of the water of their wells:—his advising water to be showered down suspicious wells from the nozle of a garden watering-pot in order to discharge damps, before men ventured to descend;—his directing air-holes to be left in the out-walls of ground rooms, to prevent the rotting of floors & joists;—his earnest dissuasive to young people, not to drink their tea scalding hot; his advice to water-men at a ferry, how they might best preserve & keep sound the bottoms or floors of their boats;—his teaching the house-wife to place an inverted tea-cup at the bottom of her pies & tarts to prevent the syrop from boiling over, & to preserve the juice;—his many tho' unsuccessful attempts to find an adequate succedaneum for yeast or barm, so difficult to be procured in severe winters, & in many lonely situations;—his endeavour to destroy insects on wall-fruit-trees by quick-silver poured into holes bored in their stems;—& his experiments to dissolve the stone in human bodies, by, as I think, the juice of onions;—are a few, among many, of those benevolent, & useful pursuits on which his mind was constantly bent. Tho' a man of a Baronet's family, & of one of the best houses in Kent,[3] yet was his Humility so prevalent, that he did not disdain the lowest offices, provided they tended to the good of his fellow creatures. The last act of benevolence in which I saw him employed was, at his rectory of Faringdon, the next parish to this, where I found him in the street with his paint-pot before him, & much busied in painting white with his own hands the tops of the foot-path

[2] An extract from Hales's 'Hæmastatics' (p. 360) will be found embodied by White in a note to his Sixth Letter to Pennant.—J.E.H.

[3] See note [1] to the first letter in the present series.—J.E.H.

posts, that his neighbours might not be injured by running against them in the dark. His whole mind seemed replete with experiment, which of course gave a tincture, & turn to his conversation, often somewhat peculiar, but always interesting. He used to lament to my Father, how tedious a task it was to convince men, that sweet air was better than foul, alluding to his ventilators: and once told him, with some degree of emotion, that the first time he went on board a ship in harbour at Portsmouth, the officers were rude to him; & that he verily believed he should never have prevailed to have seen his ventilators in use in the royal navy, had not Lord Sandwich,[4] then first Lord of the admiralty, abetted his pursuits in a liberal manner, and sent him down to the Commissioners of the dock with letters of recommendation. It should not be forgotten that our friend, under the patronage of Sir Joseph Jekyll,[5] was instrumental in procuring the Gin-act, & stopping that profusion of spirituous liquors which threat'ned to ruin the morals & constitutions of our common people at once.[6] He used to say, that the hogs of distillers were more brutal than the hogs of other men; & that, when drunk they used to bite pieces out of each other's backs, & sides! With due respects I remain,

Your most humble servant,

GIL. WHITE.

I did myself the honour of writing to you very lately about trees, & other matters. This winter continues wet & mild: wet springs are bad for Selborne. My crocus's make a fine show.

[4] John Montagu, Earl of Sandwich, born 1718, three times First Lord of the Admiralty, and holder of that office during the very eventful period of Lord North's administration. In his lifetime he was popularly known by the nickname of "Jemmy Twitcher," from a character in Gray's 'Beggars' Opera,' but is now best remembered by the group of islands which Cook (whom he greatly encouraged) named after him. He died in 1792.—A.N.

[5] Sir Joseph Jekyll, born 1664. An eminent Whig statesman, and Master of the Rolls to George I. Died 1738.—A.N.

[6] The name of Dr. Stephen Hales, says his biographer, is to be remembered with respect as an early advocate of Temperance, in the cause of which, as before stated, he indited numerous sermons and tracts.—J. E. H.

LETTER VII.

[Marsham to White.]

STRATTON MARCH 1. 1791.

DEAR SIR,

I was intending to write you my thanks for the favour of your pleasing letter of the 18th. of Jan: but waited for something to arise that might afford you some pleasure; when this day's post brought me the honour of your letter of the 25 of Feb. Every article relating to that excellent man the late Dr. Hales, cannot fail of being pleasing to me. I never saw him towards being angry, but when he talked against Gin. I think it was first from him that i heard Onions were good for people suffering with the Stone. I then thought but little about it: but as i have, for two years past, felt some painful symptoms of that malady, i often sup on roasted Portugal Onions, and hope i receive benefit from them.—My good Friend, when you touch upon Trees, you touch my mad string. My favourite Oak is 12 F. 6 I. but this is at one foot from the Earth, and Sr Simeon Stuart's[1] Oak is 14 feet at 4 feet from the Earth. The best Oak i have, is 14 F. 2 I.½ at 5 feet, which is above 19 feet at one foot, and 16 F. 9 I. at 3 feet. But i lately was told that Mr Archer of Hale near Downton in Wiltshire has eight Oakes in his park or pasture, for which he has been offered eight hundred pounds. This account is so extraordinary that i wish i knew any man that lived near the place, that i might enquire the measures of them. I forget whether i told you of Mr Leigh's Oaks at Stonleigh Abbey in Warwickshire? The largest is at 5 feet, 23 F. 11 I. in circumfer.

As the following relates to our favourite Trees (Beech) i will intrude on your patience with a memorandum of mine dated May 26. 1752, when i was with my worthy friend Mr Naylor at his Castle of Hurstmonceux in Sussex, viz. "The finest Grove of Beeches in "the park that i ever saw. One felled two years ago, ran 81 feet "before it headed. I felled one an underling very small in the "Grove merely to guess the height of its neighbours, which was " + 62 feet to the head. I believe some are above 100 f. high,

[1] Sir Simeon Stuart, of Harteley Mauduit in Hampshire, and M.P. for that county, succeeded his father in 1761.—A.N.

"and run 80, or very near, before they head, and i think some are "70 without a branch. Some are large & spreading. I measured "one + 16 F. round at 5 f. a very handsome one + 13 f. "& an extreme handsome one 11 F. 5 I. & ½. the handsomest "is but 10 F. 6 I. an Arm of one standing single extended + 20 paces "from the trunk." Again in 1767. Some Beeches laid felled in "the park, one was + 72 feet long as cut for timber, squared "above 2 feet at 24 f. length; & marked 222 feet:" a Grove of tall "Chesnuts near the Beeches from 10 to 12 feet in circumf. "at 5 feet. I do not love the Chestnuts no more than you: they have nothing of the obedience towards their masters which Beeches show: if you cut off an Arm of Beech, they seldom produce another; but an Oak will give you 2 for one, & a Chestnut (in defyance) 5 or more for one. I have this winter had several favourite Beeches digged round, two spades deep, as far as the roots extend, in hopes it may promote their growth. But i do not recommend this as œconomy. If i can thus gain half an inch extra, i reckon myself paid the 3 half crowns expended on the Tree.

My eyes water so much that i am forced to write by instalments, as Bankrupts pay their debts.—The Swallow was dead, & a wing torn off.—I certainly never remember so much thunder in a winter as in this, & perhaps not so much wind & rain. But as i do not measure the rain, i am not certain.—Tho' the Season has been uncommonly mild, i do not find the Indications of Spring so early. e.g Snowdrop F. Jan. 16. Thrush sings Feb. 14. Rooks build Mar. 2 & i have not heard a Ring-dove coo yet; but stockdoves on the 23 of Feb.

In my favourite Book, the Nat. Hist. of Selborne, i am perplexed to find C. Taylor Vicar in 1784,[2] as i thought you had the Vicarage: and i suppose that your namesake, in 1691, the charitable Vicar was an Ancestor of your's.

I should have gone on with last Winter, & as a strong proof of its mildness have told you that i have a Hawthorn & a Hornbeam both headed last year, ye first still full leafed, & green, the last, some leaves green.—I forget the authority, but i am confident i

[2] 'Antiquities of Selborne,' Letter VI.—A.N.

have heard that old London was built of Chestnut.[3] 'Tho' 'tis apt to be split with frost, 'tis certainly lasting Timber, although it grows quick. Perhaps i may have told you before now, that a Chestnut; which i raised from the nut, measures Timber at 55 f. high, & is a very handsome Tree. I wish i could view your Beech of 74 feet, & your pleasing outlet: alas! all round me is as flat as round Thorney. I am, with true esteem, my dear Sir, your most humble,

& obliged servant,

R: MARSHAM.

Ld Stawell's bird must be a great curiosity. Mar. 4

P.S. In 1748 i inclosed above 20 Acres of my Waste, & planted it. The poorest Land with Scotch Firs, & the best with Beeches, & another part chiefly with Oaks. I wish i could walk with you about this Wood, as i believe you would find more variety than you expected. One part of the Beech are tall Grove, & near that they are short & spreading. The Oaks also are part tall & part pollards &c. Although i walk in it most days, yet i am never weary of it; but when alone can look, & admire the different beauties of ye different shapes of ye Trees. One Beech already extends its Branches ten yards from the trunk. I have a Lingstack in it for rest & shelter, (not half so pretty as your Hermitage) but it takes the Cathedral of Norwich, & 2 Country Churches into view.—Mar. 5. i have just heard a Ringdove coo, & seen a Hawthorn l. my first Crocus F. was Feb. 10.

[This letter is endorsed by White. "Did you see any beeches in Italy? Lombardy Poplars? Chestnuts. Clapham Common."—Memoranda of his answer, which is missing, as will be seen by Marsham's reply.—T.S.]

[3] The statement is made by Ducarel (Phil. Trans. lxi. p.137 for 1771) but, as appears by Marsham's next letter; he had not seen it there.—A.N.

LETTER VIII.

[Marsham to White.]

STRATTON: JULY 8. 91.
1791.

DEAR SIR,

My thanks are justly due to you for the favour of your pleasing letter of the 8th of June. If i am not the wiser for every letter of yours, 'tis my own fault, or want of memory. In not seeing Herstmonceux, you lost not only the sight of the tall Beeches &c in the park, but also one of the most entire old Castles in England. I find by my notes, 'tis 77 of my steps (suppose yards) long, & 72 deep. & the moat 20 yards broad. The great staircase 40 feet square, & 22 back stairs, so like each other, that i chalked my door, to prevent my going into rooms that i should not; they being 48 on a floor as my friend told me. Your letter made me look over my old journal, which i believe i had not done of 50 years, & i find no mention of Beeches in Italy; nor does my memory supply me with any. I remember some in Switzerland near Bern, that were mixed with Firs, that i think were very tall but not large. The poplars in Lombardy, are lost to my memory, & are not mentioned in my journal: but in the public walks by Florence a part was felled, & i find some were above 100 feet long, & very slender. I greatly dislike the Tree in England. I noticed a wood of Oakes betwixt Rome & Naples, being very tall but not large, & the leaf more indented than ours. So i send you a leaf.

I am obliged to you for engaging your Nephew at Salisbury to gain intelligence of Mr Archer's Oakes: but i believe 'tis unnecessary. A friend was with me lately, to whom i told the account. He said he had been at Mr Archer's, & "remembers some Trees by "his house, which appeared nothing extraordinary; like some of "your best." Now my best was but 25 guineas.—I got a peep at Mr Rook's sketches of the Duke of Portland's Oaks.[1] But i fear he is a bad calculator of the age of Trees from their size.

[1] A plate giving "A North West View of the Green Dale Oak near Welbeck," no doubt one of those to which reference is intended, is given in Hunter's edition of Evelyn's work (vol. ii. to face page 200) and bears in the corner "A. Rooker Sculpsit."—A.N.

I have not seen Daines Barrington's controversy with Dr Ducarrel.[2] But although I respect Mr Barrington, yet i must see he is too partial to any opinion that he has adopted, to allow the weight of any evidence that makes against him. You may remember his zeal against birds migrating.[3] The latest bird that i have noticed appearing here, I mean its first appearance, is the Fern Owle. I saw one this Spring May 2. but did not hear one sing 'till June 14th. I wonder Willoughby says nothing of their migrating.—I have been much entertained with Mr Townsend's travels in Spain.[4] But i must conclude that he was misinformed when he says that "Nightingales sing all the year" Vol. 3. p. 45. Your friend that lived in Andalusia, i doubt not, knew it is not so. With us the song of that bird is confined to as short a time as any. By the bye, i was as careful as in my power towards the love-making of the frogs last Spring, & the gentlewoman seemed to be a toad. She *walked*, not *jumped*, her belly was the ash colour with black spots, & the colour of her back, like the toad. I am ignorant of the characteristic marks of either of yr gentry. I was pleased long ago, with the rows of Oakes by Odiham, as growing well upon unpromising Land. But i have seen great Oakes upon absolute sand. viz Ld Thanet's in Westmoreland[5] was 31 F. 9 I round in 1765 & Mr Lemon's at Northaw

[2] In the 'Philosophical Transactions' for 1769 (vol. lix.) is a communication from Barrington "on Trees which are supposed to be indigenous to Great Britain," in the course of which he maintained that the Spanish Chestnut was not one of them, and controverted the opinion of Ducarel previously published *(Anglo-Norman Antiquities, p. 96)* that not only was old London built of Chestnut-timber, but that there still existed a large tract of Chestnut Woods near Sittingbourne in Kent. The controversy was continued by Ducarel and others in 1771 (Phil. Trans., vol. lxi., pp. 136—166), and Barrington replied on the whole case *(tom. cit.* pp. 167—169*)*. Barrington seems on the whole to have been right (see Loudon, Arb. Brit. p. 1987).—A.N.

[3] Barrington contributed to the 'Philosophical Transactions' for 1772 (vol. lxii. pp. 265—326), "An Essay on the periodical Appearance and Disappearance of certain Birds at different Times of the year."—A.N.

[4] 'A Journey through Spain in the years 1786 and 1787. By Joseph Townsend, A.M. Rector of Pewsey, Wilts; and late of Clare-Hall, Cambridge.' Second Edition, 3 vols. London: 1792. The author being of the same College as Marsham was very likely personally known to him.—A.N.

[5] At Whinfield Park (Loudon, *ut supra* p. 1771).—A.N.

Herts, whose top was the largest i ever saw: some arms extended full 60 feet from the trunk, which was 19. feet 7 In. round: i could not omit this in ye paper on ye increase of Trees in ye Ph. Trans. 1759. We have only the Oak with the long stalk to the acorn, & the leaf without stalk. I thought the Oaks in Sussex, & many other Counties more pleasing trees than in Norfolk; but i did not observe the leaves. I remember near Ucfield, in the road from London to Herstmonceux, an Oak with yellow leaves; which struck me as very curious, & my good friend Naylor got me some of the acorns, but none grew. I presume you have noticed this Oak, as i have heard of another with leaves as yellow as the Elm in autumn.

In answer to your last Article, i was a young fellow in 1733 when many Counties were inflamed with contested Elections (when Sr S. Stuart lost his Election by 2 in your County) & engaged warmly in that new amusement: & drank & smoked for the Cause, although i relished neither. But old age that blunts the edge of all passions, & my seeing according to Pope——— "how "like, Whig Ministers to Tory," has cooled my party zeal: & i feel myself satisfied with giving my vote for a friend, without enquiring about his party. So if you had asked me my party, i can hardly tell you. But i will add, that i love the King, & the Constitution, & am disliked by both parties.

Two articles of your letter vex me, viz that your infirmities deprive me of the pleasure of seeing you in Norfolk; the other, that in naming me, you have struck out the word *friend*, & put *correspondent*. I should have been proud, to be called *friend* by the Author of the Hist. of Selborne: for i am with great esteem, dear Sir, your most humble

& obliged servant

R: Marsham

P.S. Although last Winter & the fore-part of Spring, were (i think) the mildest that i remember (except the Earthquake year 1750) yet I find many articles of Spring later than in several colder Seasons. I find snow on ye 5th of May. We have had some drying E. wind, but hardly to be called hot. The begining of June 2 or 3 days the air was thick, in small degree like what you noticed in 1783. Letter 64. On the last of June i found my

best Oak & best Beech had each increased an inch, which ii find is more than my Trees had done in the two years measurement, which are in the Ph. Tr. in 1758. so i hope for a good year's growth : as they have two months more to grow. The lateral shoots of healthy Beeches are 2 feet; & one of the Copper coloured Beech is near 21 inches.

I am with great esteem
Dear Sir your most humble
& obliged servant
R: MARSHAM.

P.S. when i wrote this i hoped for a friend to direct it; but no neighbours are come down: & i am ashamed to make you pay for a leaf. I did not see i had concluded my letter before, but am too lazy to write it over again; & hope you will pardon this, & the many other blunders in an old fellow of 84.

LETTER IX.

[White to Marsham.]

SELBORNE NEAR ALTON:
DECR. 19. 1791.

DEAR SIR,

Your letter, which met me so punctually in London, was so intelligent, & so entertaining, as to have merited a better treatment, & not to have been permitted to have lain so long unnoticed!

That there is no rule without an exception is an observation that holds good in Nat. History: for tho' you & I have often remarked that *Swifts* leave us in general by the first week in August: yet I see by my journal of this year, that a relation of mine had under the eaves of his dwelling house in a nest a young squab swift, which the dam attended with great assiduity till September

6th,[1]—& on Octob^{r} 22. I discovered here at Selborne three *young martins* in a nest, which the dams fed & attended with great affection on to Novem^{r} 1st, a severe frosty day; when they disappeared; & one was found dead in a neighbour's garden. The middle of last Septem^{r} was a sweet season! during this lovely weather the congregating flocks of house martins on the Church & tower were very beautiful & amusing! When they flew off all together from the roof, on any alarm, they quite swarmed in the air. But they soon settled again in heaps on the shingles; where preening their feathers, & lifting up their wings to admit the rays of the sun, they seemed highly to enjoy the warm situation. Thus did they spend the heat of the day, preparing for their Migration, & as it were consulting when & where they are to go! The flight about the church consisted chiefly of h. martins, about 400 in number: but there were other places of rendezvous about the village, frequented at the same time. The swallows seem to delight more in holding their assemblies on trees. Such sights as these fill me with enthusiasm! & make me cry out involuntarily,

> "Amusive birds! say where your hid retreat,
> When the frost rages, & the tempests beat!"[2]

We have very great oaks here also on absolute sand. For over Wolmer forest, at Bramshot place where I visit, I measur'd last summer three great hollow oaks, which made a very grotesque appearance at the entrance of the avenue, & found the largest 21 feet in girth at five feet from the ground. The largest Sycamore in my friend's court measures 13 feet. His edible chestnuts grow amazingly, but make (for some have been felled) vile *shaky*, *cupshaky* timber.[3] I think the oak on sands is shaky, as it is also on our rocks, as I know by sad experience the last time I

[1] The length of stay which the Swifts make with us in Autumn must in some measure depend upon the locality which they frequent during the Summer, for in the parish of Harting, Sussex, (not more than a dozen miles from Selborne,) I have remarked during the last ten years that these birds invariably remain until the end of the first week in September, or at least a month after the average date of their departure as observed by White at Selborne. See Letter xxxvii. to Pennant.—J. E. H.

[2] These original lines occur in "The Naturalist's Summer Evening Walk, which White dedicated to Pennant.—J. E. H.

[3] See note 8, p. 142, to the second letter of the present series.—J. E. H.

week, viz. from Nov. 13th to the 19th both inclusive! You will, I hope, pardon my neglect, & write soon. O, that I had known you forty years ago! I remain, with great esteem,

Yr most humble servant,

Gil. White.

My tortoise was very backward this year in preparing his Hybernaculum; & did not retire till towards the beginning of Decemr. The late great snow hardly reached us, & was gone at once.

built.—The indented oaken leaf which you gather'd between Rome, & Naples was the *quercus cerris* of Linnæus.[4] The yellow oak which you saw in Sussex escaped my notice.

Richard Muliman Trench Chiswell Esq. of Portland Place, & M. P.[5] tells a friend of mine in town that he has an *Elm* in Essex for which he has been bid £100. It is long enough, he says, to make a keel ungrafted for a man-of-war of the largest dimensions. As he expressed a desire of corresponding with me, I have written to him, & desired some particulars respecting this amazing tree.

You seem to wonder that Mr. Willughby should not be aware that the Fern-owl is a summer bird of passage. But you must remember that those excellent men, *Willughby & Ray*, wrote when the ornithology of England, & indeed the Nat: History was quite in it's infancy. But their efforts were prodigious; & indeed they were the Fathers of that delightful study in this kingdom. I have thoughts of sending a paper to the R. S. respecting the fern-owl; & seem to think that I can advance some particulars concerning that peculiar, migratory, nocturnal bird, that have never been noticed before. The rain of Octo^r. last was great, but of Novr. still more. The former month produced 6 in. 49 hund. but the latter upwards of 8 in.: five & ½ of which fell in one week, viz. from Nov. 13th to the 19th. both inclusive! You will, I hope, pardon my neglect, & write soon. O, that I had known you forty years ago!

I remain, with great esteem,

Y^r. most humble servant,

GIL. WHITE.

My tortoise was very backward this year in preparing his Hybernaculum; & did not retire till towards the beginning of Decem^r.[6] The late great snow hardly reached us, & was gone at once.

[4] This, the Turkish oak, was introduced into this country about a century ago, from the South of Europe and is now much planted as an ornamental tree.—J. E. H.

[5] Returned for Aldborough in the county of York, (London Gazette, 3rd August, 1790.)—A. N.

[6] In previous years this "old Sussex tortoise began first to dig the ground, in order to the forming its hybernaculum, on Nov. 1st," (Letter XIII to

LETTER X.

[Marsham to White.]

STRATTON: FEB. 12. 1792.

DEAR SIR,

Many thanks are due to you for your very pleasing & instructing letter of the 19th. of Decr. but procrastination has prevented your receiving them. This failing which afflicted me in my younger days, increases in æt. 85; & as i have nothing worth communicating to you, it might safely have continued longer. Our Winter began early, & was uncommonly severe before Xmass. From the 8 of Decr. to the 23d, was constant frost, with little snow. The 12th, was the coldest, viz near 10 below friezing point. We here, like you in Hampshire had but little snow. I had a Woodcock in my house the first of October.

Your new correspondent's Elm seems to me extraordinary. You know the keel of a first-rate ship of War, is 147 feet long. This cannot be less than 8 feet round. As Elm is generally slender in proportion to the height, Mr. Chiswell's Elm should be at least 200 feet high: viz near double the height of the tall Trees of this Island; credat &c. The tallest Elms i can recollect are by St John's Coll. Camb. which i should think are not much above 100 feet. You know i traced Mr. Archer's Oaks near Downton, 'till they contracted into sticks. You may remember, that Dr Hunter in his notes in his edition of Evelyn's Silva, says that an hundred of Sr Rowland

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Daines Barrington,) and "retired under ground about the 20th of November." (Letter XVII to Daines Barrington.) It was not until April, 1780, that White was able to announce to his friend that the animal had become his property. (Letter L. to Daines Barrington.)

This tortoise survived its master about a year, dying, it is believed, in the spring of 1794, after an existence in England of about fifty-four years, the last fourteen of which were spent at Selborne. Its shell, which is still preserved at Selborne, in the residence of the former owner, is considered by Mr. Bell to be that of *Testudo marginata*, the largest of the three European tortoises, but Mr. Bennett, for reasons stated by him in a note to his edition of the 'Natural History of Selborne,' was of opinion that it should be referred to a distinct species, and he proposed for it the specific name *whitei*, in compliment to its former owner, a piece of mistaken zeal on his part.—J.E.H.

Wynn's Oakes sold for 5000£.[1] This i investigated, by my good friend Lord Suffield, & find it is true. Two of the Trees called the Lord & the Lady were valued at 70 Guineas each. In another note, he says without good authority, that the Earl of Hertford[2] fell'd a Wych Elm in his park in Lisburn (Ireland) that contained 99 tun of timber.[3] Being known to his Lordship when abroad, i wrote to him; and his Ldp tells me, it was an *Oak* not *Elm*, that he did not *fell* it, but it *fell of itself*, in a calm summer day, to his sorrow. It was sound, the trunk or body was 29 feet long, & 36 in circumference. which sold for 48£. one piece of the head for 5£. 10£. for Bark, and 58£. for the rest of the head. Tot. 121£. As we do not know where the circ. was taken, you see we are left in ignorance: if at 14 f ½ which should be, then his Ldp was abominably cheated. Hunter also mentions an Ash at Leg or Leix in Queens County in Ireland 39 f round near the ground, and 28 f. at six f. I try'd for an account of this Tree from my great neighbour the Earl of Bucks[4] when he was Lieu^t^ which not receiving so early as i wished, i wrote to my old friend Dr Man Bp of Corke. But all i have gained is, that a print of it was engraving in London. This i have not seen: & a print without a scale would certainly not satisfy my curiosity.—Your friends Sycamore is a little larger than I have seen, and his pollard Oaks are respectable.

I observed nothing remarkable in this Winter but a greater number of the red-wing Thrush than usual, & have as yet but Two articles for my Indications of Spring for 92. viz Snow-drop F. Jan. 25. & yellow Butterfly this day. Your Relations Swifts delay was extraordinary. My Swallows left me Sep. 27. but one was seen within 5 miles on ye last of October.—I shall long for your account of the fern Owl in the Ph. Trans, as i conclude you

[1] Hunter (*op. cit.* ii. p. 288) however says *fifty* tons for £2,500.—A N.

[2] Francis Seymour succeeded his father as Lord Conway in 1732, was created Earl of Hertford in 1750, and Marquess in 1793. Died in 1796.—A.N.

[3] I have not been able to find Hunter's reference to this tree or to the Ash presently mentioned.—A.N.

[4] John Hobart, succeeded his father as Earl of Buckinghamshire and owner of Blickling in Norfolk, in 1756, Ambassador at St. Petersburg in 1762, Lord Lieutenant of Ireland in 1777, died in 1793.—A.N.

can give a better account of that harmless pleasing bird than i have seen. We used to have more of them formerly than of late years. I have never heard one sing on the wing. I love the Swallows & H. Martins so well, that i lament the want of their company in Autumn as heartily & as much as i do the warm weather. I should have concluded from your Tortoise's late hiding that the winter would be mild.

I conclude that you have read Boswell's life of Dr Johnson. A friend of Dr Horne's[5] (late Bp of Norwich) told me, that his Ldp had read it twice, & was going the 3d time thro' it; & said it was the most entertaining Book he ever read. It made me laugh several times; but the banter upon it, in the new Lady's Magazine for Sepr. last, made me laugh more heartily. If you love a laugh (which you must do, as you are a wise man) you cannot fail of it by that sketch. 'Tis supposed to be by the Author of the Bath guide.[6] I took the trouble of transcribing it, in order to bind it with Boswell, as a Supplement. I presume you have seen Gilpin's Book of the views in the new Forest,[7] & noticed his false quotation of Bryden's letter:[8] where he says the Chesnut on M. Ætna is 204 f. in *circumf.* which he unluckily writes *Diameter:* as if the Tree was not large enough! Townsend says in his travels in Spain, at Valez,[9] Nightingales sing all the year. I wish you would ask your Friend in Spain, if that is true?

I know that you do not love Chesnut-trees, but as a good man you are not averse to hearing of some merit in them. The great Land-stuard Mr. Kent,[10] told me 'tother day, that at Mr. Wind-

[5] See note 10, page 178.

[6] This piece, however. is not included among the poetical works of Anstey, who wrote 'The New Bath Guide,' as collected and published by his son in 1808.—A.N.

[7] 'Remarks on Forest Scenery, &c., by William Gilpin.,' 2 vols. London: 1791. (vol. i. p. 130.)—A.N.

[8] 'A Tour through Sicily and Malta. In a series of letters to W. Beckford, Esq. from P. Brydone, F.R.S. New Edition.' 2 vols. London: 1790. (vol. i. p. 119.)—A.N.

[9] Townsend (*loc. cit.*) wrote "Velez," *i.e.* Velez Malaga, an older city than the present Malaga, on the old main road to Granada.—J.E.H.

[10] Nathaniel Kent, "A well-known and highly respectable land and timber surveyor" (Loudon, *op. cit.* p. 1993). The details given in the text are included by him in a paper (Trans. Soc. Arts, vol. x. p. 31).—A.N.

ham's,[11] removing the place of a gateway, one post was Oak, the other Chesnut only a foot square, & by the date on it had stood 50 years. This was sound, & set down again; & the Oak was quite rotten. & some years ago, some railing was done at Mr. Windhams with posts of Oak & Chesnut (the same size) these being moved this year, all those of Oak were rotten, & all of Chesnut served again. But this Tree certainly splits more with frost, than Oak; but must be excellent for paling. Had Fortune given me your acquaintance 40 years ago, i should have been a great gainer, & you but little. Be assured dear Sir, that your letters are always a Feast to me, & that i remain with true esteem your most humble servant

R: MARSHAM.

P.S. As long as i have measured Trees, by way of calculating their age by their size, i did not attend to the height from the earth, when i took the circumference: & i find my friends have been as careless as myself. Whereas an Oak mostly increases one third more at one foot from the earth, than it does at 5 feet. Thus, e. g. the Oak i planted in 1720, is at 5 f. 9 F. 5 I. 7 10′. & at 1 f. is 13 f. & my best Oak at 5 f. is but 14 F. 3 I., which at 1 f. is 19 F. 3 I. Now, tho' i saw my Trees were larger near the earth, i never considered that they must increase more yearly to make that bulk: & yet i think when Willoughby was writing on the fern-Owl, he should have recollected that he did not see that bird in Winter But i acknowledge he has done a great deal; & I am often obliged to him, for the trouble he has taken.

[This letter is franked by "H. Hobart," and is endorsed by White "Mr. Marsham Feb. 17. 1792."]

[11] William Windham of Felbrigg (born 1750, died 1810), for many years M.P. for Norwich and subsequently for Higham Ferrers, Chief Secretary for Ireland (1783), Secretary at War (1794—1801), and Secretary of State for War and the Colonies 1806—1807. The evidence afforded by the next of Marsham's letters shews that he was recommended to White's book by Windham, who possibly became acquainted with it through Daines Barrington like himself a member of "The Club." In connexion with the text may also be mentioned Loudon's statement (*op. cit.* p. 1990) that one of Windham's ancestors was a considerable planter of Chestnuts.—A.N.

LETTER XI.

[White to Marsham.]

SELBORNE: MAR. 20TH, 1792.

DEAR SIR,

You, in a mild way, complain a little of *Procrastination:* but I, who have suffered all my life long by that evil power, call her the *Dæmon* of *Procrastination;* & wish that *Fuseli,*[1] the grotesque painter in London, who excells in drawing witches, dæmons, incubus's & incantations, was employed in delineating this ugly hag, which fascinates in some measure the most determined, & resolute of men.

You do not, I find, seem to assent to my story respecting Mr. Chiswell's elm. There may be probably some misapprehension on my side. I will therefore allow Mr. Ch. that priviledge which every Englishman demands as his right, the liberty of speaking for himself. "In regard to my tree," says he, "it is a *Wych Elm,* perfectly strait, & fit for the keel of the largest man of war. The purveyor of the navy offered my late Uncle £50 for it, altho' it would have cost as much more to have conveyed it to Portsmouth; & he would have run all risque of soundness. It grows about eleven miles from Safron Walden, in a deep soil, & near 30 from Cambridge, the nearest place for water-carriage. I will measure it next summer."—He adds, "I have been, & am a considerable planter; & have been honoured with three gold medals from the Society of Arts," &c. Thus far Mr. Ch.

As I begin to look upon You as a Selborne man, at least as one somewhat interested in the concerns of this place; I wish that You could see "The sixth Report of the Commissioners appointed to enquire into the state, & condition of the Woods, Forests, &c. of the Crown," &c. This Report was printed February, 1790; tho' never published: but distributed among the members of the house of commons from some of whom You may borrow it, as I have done. This curious survey will inform you, from the best authority, of all the circumstances respecting the advantages, usages, abuses, &c. of our Forest of Alice Holt, & Wolmer. Here you will see,

[1] Born at Zurich, 1741; died in England, 1825.—A.N.

that the Forest now consists of 8694 acres, 107 of which are in ponds; that the present timber is estimated at £60,000;[2] that it is almost all of a size, & about 100 years old; that it is shamefully abused by the neighbouring poor, who lop it, & top it as they please; that there is no succession because all the bushes are destroyed by the commoners around;[3] that y^r^. old favourite Oak, the *Grindstone Oak*, is estimated at 27 loads of timber; that the

THE GRINDSTONE OAK.

[2] This survey and valuation was made in 1787. Wolmer, with but two enclosures within its precincts, then extended over 5,949 acres; the royal forest of the Holt, with its enclosures, was found to comprehend 2,744 acres. The timber of the Holt was valued at £61,000. See Letter VIII. to Pennant.—J.E.H.

[3] The wrong-doers in this case were the poor of the parishes of Binstead and Frinsham, Bentley and Kingsley, who layed claim to "the lop and top" in opposition to Lord Stawell, the grantee. "Forty-five of these people his lordship served with actions." See Letter IX to Pennant.—J.E.H.

peat cut in Wolmer is prodigious; in the year 1788 in one walk 942 loads; & in another walk the same year 423 loads, besides heath, & fern; & in the same year 935,000 turves; &c. &c. &c. Lord Stawell is the Lieutenant, or Grantee, whose lease expires in 1811, as I have said in my book.[4] That Nobleman did me the honour to call on me a morning or two ago, & sat with me two hours: he brought me a white wood cock, milk white all over except a few spots.

My friend at Bramshot place, where I measured the great pollard oaks, & Sycamore last summer, has got a great range of chesnut-paling; I shall tell him what Mr. Kent says respecting timber of that sort. The rain with us in 1791 was 44 in. 93 hund.: upwards of 8 inches of which fell in November! the rain of the present year has been considerable. Our indications of spring this year are thus: Jan. 19. *winter-aconite* blows: Jan. 21. *Hepaticas* blow. Jan. 29. *Snowdrop* blows: 31. Hasels: Feb. 4. *Crocus* b.: 13. *brimstone butter-fly;* 21. *yellow wagtail* appears. 26. *Humble bee:* March 16. *daffodil blows*, and *Apricot:* 19. *peaches, & nectarines.* I have read *Boswell's Johnson* with pleasure. As to Bishop Horne I knew him well for near 40 years: he has often been at my House. Stillingfleet, I see, wrote his *Calendar* of *Flora* at your house: He speaks in high terms of the hospitable treatment that he experienced at Stratton.[5]

Wonderful is the regularity observed by nature! I have often remarked that the smallest *willow wren*, (see my Book) called here the *Chif-chaf* from it's two loud sharp notes, is always the *first spring bird* of passage, & that it is heard usually on March 20:[6] when behold, as I was writing this very page, my servant looked in at the parlour door, & said that a neighbour had heard the *Chif-chaf* this morning!! These are incidents that must make the most indifferent look on the works of the Creation with wonder!

[4] Letter IX to Pennant. On the expiration of the grant to Lord Stawell, the Commissioners of Woods and Forests resumed possession of the Holt. All the lands held by him, and two-thirds of the former open forest were subsequently enclosed and planted.—J.E.H.

[5] See the second letter of the present series, and note thereto.—J.E.H.

[6] The substance of this remark will be found already published in the "Observations on Birds" under the head of "Chiff Chaff."—J. E. H.

My old tortoise lies under my laurel-hedge, & seems as yet to be sunk in profound slumbers.[7] You surprise me, when You mention y^r. age: y^r. neat hand, & accurate language would make one suppose you were not 50. I remain, with true esteem,

Y^r. most obliged servant,

GIL. WHITE.

When Mr. Townsend avers that the Nightingales at *Valez* sing the winter thro', I should conclude that he took up that notion on meer report; because I had a brother who lived 18 years at Gibraltar, & who has written an accurate Nat. Hist. of that rock, & it's environs. Now he says, that Nightingales leave Andalusia as regularly towards autumn as other Summer birds of passage. A pair always breeds in the Govern^rs. garden at the Convent. This Hist. has never been published, & probably now never will, because the poor author has been dead some years. There is in his journals such ocular demonstration of *swallow emigration* to, & from Barbary at Spring, and fall, as, I know, would delight you much. There is an *Hirundo hiberna*, that comes to Gibraltar in Oct^r. & departs in March; & abounds in & about the Garrison the winter thro'.[8]

LETTER XII.

[Marsham to White.]

STRATTON: JULY 14. 92.

MY DEAR SIR,

After many attempts on my part, at length our inveterate enemy, Madam Procrastination, has permitted me to offer my thanks to you for your very pleasing letter of the 20th. of March. As one of 85 years i acknowledge her haggard form;

[7] See *antea* p. 163, note 6.—J. E. H.

[8] See Letter XXXII. to Pennant, where White identifies his brother's bird, and correctly so, with the *Hirundo rupestris* of Scopoli. It is again mentioned by him in the 15th letter of the present series.—J. E. H.

but half a century ago, she sometimes appeared as a Siren. So Fuseli may be puzzled, whether he should paint her young or old.

You oblige me, & i heartily thank you, for looking on me as a Selborne man. I am certainly a well-wisher wherever your interest, or pleasure is concerned. All the compliment i can make you in return, is to call a favourite Beech by the name of Mr White's Beech. You know Linnæus complimented his friends, by calling new plants after their names. This is not in my power to do, as i know but few old ones. But you should know some particulars of your Tree. 'Tis about 50 years old, & runs clear about 25 feet, then about as much in handsome head, preserving its stem straight to the top, & spreads a circle of about 50 feet diameter. This i reckon the handsomest proportion for an out-side Grove Tree. For an inside Grove Tree, i should wish the stem longer, about 2 thirds of the height, & the spread of the head less: & for the Lawn or single pasture Tree, i wish the branches should hang so low as only to suffer a man to ride on horsback under them; & the Tree to appear at a little distance like a green hill. These are my proportions for the beauty of Trees in different situations. But i will quarrel with no man, if he likes other proportions better. I presume that Grove of Oaks called Losels, mentioned in my favourite Book, p. 5. ran clear stems 4, 5^{ths} of their height: which runs them too like to hop-poles. And perhaps the venerable Oak which stood in the Plestor, was the very shape i wish a single Tree to be! I remember an Oak of Mr Leman's at North hall in Hertfordshire, that spread a circle of about 130 feet diameter. And the Bp of Bath & Wells[1] informed me, that the Bp of Salisbury's Oak spread 115 feet in the longest diameter, & 112 in the shortest; & appeared at a distance a perfect semi-globe. Although i am much pleas'd with your view of Selborne, & the description you give of it, yet the great quantity of rain that falls there, is a strong drawback to the pleasure of living. above 50 inches in 1782, & last year almost 45, seems to me very

[1] Charles Moss, Bishop of St. David's, 1766, Bishop of Bath and Wells, 1776, died 1802. Marsham's communications, before mentioned, to the Royal Society, on washing trees was in the form of a letter to him.—A.N.

extraordinary; as 'tis above double what Dr Arbuthnot supposes falls upon the Globe viz 22 inches. Essay on Air. p. 88. where you find but 19 inches at Paris.[2] Indeed, when i was last in Scotland (about 6 weeks) it was every day rain, more or less. We had a good deal of rain last Winter, tho' little laying snow, whilst the papers spoke of much, both in the North & West.—The Spring has been very watery, and still continues, to the grief of the Farmers, for their Hay: & notwithstanding these rains, i find the season has not been kind to my Trees. All sorts appear not in good health. My favourite Beeches appear brown rather than green, from the abundance of Mast, & very few have as yet, increased an inch in circumf. A Cedar had gained an inch & half on ye 5th but my best Oaks not above half an inch. For Indications of Spring. Jan. 25 Snowdrop F. ye 29th at Selburne. Jan. 30th Hepatica F. 21st at Selburne,—Feb. 11 Crocus F. at Selburn Feb. 4. Crocus b. Feb. 12 brimston Butterfly. at Selburne Feb. 13. Mar. 21. Daffodil F. at Selburne Mar. 16. Perhaps my deafness might deprive my hearing of Spring Birds, but i have heard hardly any Thrushes this year; & i heard not the Fern Owl, 'till June 26. Here i must observe with mortification that my Phil. Trans. brought me no account of the fern-Owl, which i

[2] John Arbuthnot, M.D. Born 1675. Died 1735. Distinguished alike for his skill as a physician, and for his literary attainments; he was an intimate friend of Swift, Pope, and Gay. Pope used to say that of all the men he knew, Dr. Arbuthnot had the most prolific wit, and that in this quality Swift only had the second place (See Ruffhead's 'Life of Pope,' p. 209).

Dr. Johnson speaking of the eminent writers in Queen Anne's reign, observed:—"I think Dr. Arbuthnot the first man among them. He was the most universal genius, being an excellent physician, a man of deep learning, and a man of much humour."

His essay on air to which Marsham alludes was first published in 1733, and is entitled "An Essay concerning the effects of Air on human bodies." A second edition appeared posthumously in 1751 and a third in 1756. The particular passage (p. 88) above referred to, runs as follows:—

"The quantity of vapour raised and the quantity of water precipitated "from the air, as I observed before, seems to be pretty uniform, the year "round, over the surface of the terraqueous globe, perhaps about 22 inches "deep over the whole; but from accidental causes it differs considerably as "to quantity in different places, and in the same place in different years. In "a period of eight years, the quantity of water fallen from the clouds was "observed to be, at Zurich 22½ inches, at Paris 19, at Upminster 19¼, at "Pisa 43¼, in Lancashire 42¼."—J. E. H.

expected from a former letter of your's.—Beech l. Ap. 11.—Oak l. Ap. 13. Swallow Ap. 13. Cuckow Ap. 22. I put down articles in my Indications of Spring, only from my own knowledge. But i have often accounts that i fully believe e. g. a Swallow this Spring on the first of April. I should have been glad to have seen the white Woodcock Ld Stawell gave you; & i will try to borrow the sixth report of the Com^{ns} for enquiry &c. I can easily believe great abuses are practised upon them. I have an old Park (long disparked) formerly belonging to the Crown, & after to the Bp. of Norwich, & the neighbours steal as much wood from it, as i gain.—I never heard of a Winter Swallow until you named it. I should rejoice to read your Brothers Nat. Hist. of the Rock &c. Pray Sir why do you not publish it? I should think it would sell well, as curiosity seems to increase amongst mankind.—I do not know the Bird you call the Chif-chaf. But i am filled with wonder by the Harmony and Beauty of all the Works in the Creation. I remain with true esteem dear Sir your obedient

& obliged servant,

R: MARSHAM.

A gentleman of my acquaintance in this County had a tortise of above 100 years old, from the family account, which was unluckilly killed by the Gardener. As i find by your Book, you was formerly a Sportsman, i conclude you love dogs, so i may tell you an history of a favourite bitch of mine. I destroyed her first litter of whelps; her 2^{d} litter she laid in a secret place. These i also destroyed; her 3^{d} she layed in a large cony-burrow over a furlong from the house, & quite out of sight: could human wisdom do more?—She went a hunting with a partner dog, & i chastised them, the partner first: for every lash i gave it, she cried, as if suffering herself. When i whipped her, she did not cry once. Was not this feeling more for her friend than herself? & is not this a proof of more exalted friendship than you have ever known in the human race? Dr Leigh says he knew a dog starved himself on the death of his Master. See his History of Cheshire.[3]

P.S. my friend who recommended to me the Nat. Hist. of Selborne calld on me this morning & directed my letter.

[Franked by "W. Windham."]

[3] 'The Natural History of Lancashire, Cheshire, &c. By Charles Leigh.' Oxford: 1700. Folio, Book ii. pp. 8, 9.—A.N.

LETTER XIII.

[White to Marsham.]

SELBORNE: AUG^ST. 7. 1792.

DEAR SIR,

While all the young people of this neighbourhood are gone madding this morning to the great last day's review at Bagshot;[1] I am sitting soberly down to write to my friend in Norfolk; almost forgetting, now I am old, the impulse that young men feel to run after new sights; & that I myself, in the year 1756, set-off with a party at two o' the clock in the morning to see the Hessian troops reviewed on a down near Winchester.[2] While I was writing the sentence above, my servant, & some neighbours came down from the hill, & told me that they could not only hear the discharges of the ordnance & small arms, & see the volumes of

[1] "The Diary or Woodfall's Register" for Wednesday, August 8th, 1792, contains the following paragraphs:—

"Bagshot Camp. Tuesday, Four o'Clock—P.M.

"The spectacle of this day exceeded any public exhibition in this kingdom. At six at least *a hundred thousand* persons were upon the ground. At eight the King and Queen, with the Prince, the Dukes of York, Richmond, [Commander-in-Chief], &c., and their attendants. At nine the Review began in the hollow, below Cæsar's Camp. * * * * At one the concourse was so immense, that at least *one hundred* and *fifty thousand* horsemen, (exclusive of the army) were upon the field. The Pedestrians were innumerable."

* * * * * * * *

"Yesterday being the grand Review of the troops encamped on Bagshot Heath, the King went from Windsor in his Post-chaise soon after Eight o'Clock. * * The manœuvres began soon after the King's arrival, at half-past nine"—A. N.

[2] These were doubtless the forces who have left so ill a name in the United States of America. They landed at Southampton on the 15th May, 1756, (Gentleman's Magazine, 1756, p. 259) and went under canvas. Towards autumn when it was time to move them into winter quarters, there was a strong feeling on the part of the licensed victuallers against receiving them into their houses and it was doubtful how far the law allowed the billetting of foreign troops. Accordingly on the 5th November huts were ordered for them (*tom. cit.* p. 544,) but an Act of Parliament being passed compelling the same treatment to be shewn to them as to British troops, the Hessian camp began to break up on the 23rd December, and officers and men were distributed amongst the various towns in the south of England (*tom. cit.* p. 592).—A. N.

smoke from the guns; but that they could also, they thought, smell the scent of the gun-powder, the wind being N.E. & blowing directly from the scene of action at Wickham bushes, tho' they are in a direct line more than twenty miles from hence.

As I had written to you as long ago as March, I began to fear that our correspondence was interrupted by indisposition;—when your agreeable letter of July 14th came in, & relieved me from my suspence. You do me much honour by calling one of your beeches after my name. Linnæus himself was complimented with the *Linnæa borealis* by one of his friends, a mean, trailing, humble plant, growing in the steril, mossy, shady wilds of Siberia, Sweden, & Russia; while I am dignified by the title of a stately Beech, the most beautiful, & ornamental of all forest trees.[3] The reason, I should suppose, why your trees have not encreased in growth, & girth this summer is the want of heat to expand them. I have not this year measured my firs in circumference; but they have, I see, many of them, made surprising leading shoots. My account of the *Fern-owl*, or *Eve-jarr* was prevented by *Madam Procrastination*, who, a jade, lulled me in security all the spring, & told me I had time enough, & to spare, till at last I found that the R. S. meetings were prorogued till the autumn;[4] against which I hope to be ready: & as I have got my materials, trust that when I do set about the business "verba hund invista sequentur." By *all means* get a sight of the *sixth Report* of the *Commiss*^{rs}. &c., it will entertain You, & furnish You with much matter, & many anecdotes respecting Selborne, of which I could have availed myself greatly had they been printed before I published my work.[5] My book is gone to Madras, & several to France, & one to Switzerland, & one copy is going to China

[3] The genus *Linnæa* was characterised by Dr. Gronovius, and first published as a genus in 1737 in the first edition of Linnæus 'Genera Plantarum.' In the same year appeared the 'Flora Lapponcia' in which a good figure of the plant will be found, as well as in the 'Flora Suecica,' published in 1745. Only one species of the genus is known, the *Linnæa borealis*, above mentioned.—J. E. H.

[4] The meetings of the Royal Society for whose 'Transactions' the account of the Fern-owl was intended. See p. 142 note 8.—J. E. H.

[5] This Report was printed in February, 1790. See *antea* p. 168—J. E. H.

with Lord Macartney:[6] but whether some Mandareen will read it, I know not. We have a young Gent. here now on a visit, the son of our late Vicar Etty, who assures me, that at Canton he has seen the Chinese reading English books; & has heard them converse sensibly on the manners, & police of this kingdom. The *Chif-Chaf* of this village is the smallest *willow wren* of my History.[7] Once I had a spaniel that was pupped in a rabbit burrough on the verge of Wolmer forest. Tho' I have long ceased to be a sportsman, yet I still love a dog; & am attended daily by a beautiful spaniel with long ears, & a spotted nose & legs, who amuses me in my walks by sometimes springing a pheasant, or partridge, & seldom by flushing a woodcock, of late become with us a very rare bird. Remember the story of Pylades & Orestes; & do not say that exalted friendship never existed among men. *Chif-Chaf*, the first bird of passage, was heard here March 20:—*swallow* was seen March 26:—*nightingale*, and *cuckoo* Apr. 9:—*House martins* April 12:—*Redstart* April 19:—*Swift* April 14:—*Fern owl* heard May 19:—*Fly-catcher*, the latest summer bird, May 20. We have experienced a very black wet summer, & solstice; but none of those floods & devastations mentioned in the newspapers! Indeed we know no floods here, but frequent rains. Yet in warm summers we have as fine melons, & grapes, & wall-fruit as I have ever seen. July at an average produces the most rain of any English month. This last measured 5 in. & 15 h.—Pray, good Sir, procure better ink: your's is so pale, that it often renders y^r^ neat hand scarcely legible! I am now offering my intelligent young neighbours *sixpence* for every authentic anecdote that they can bring me respecting *Fern-owls;* & will give you the same *sum* for the same information. As I was coming over our down after sun-set lately, a cock bird amused us much by flying round & settling often on the turf. As he passed us, he often gave a short squeak, or rather whistle. We were near his nest. These, like other birds of passage, frequent the same spots.[8] There are

[6] Lord Macartney's embassy to China sailed from Portsmouth, 26th September, 1792 (Staunton's 'Authentic Account,' &c., i., p. 53).—A. N.

[7] See Letter XVI. to Pennant.—J. E. H.

[8] That is, the spots which they have frequented in former years. This has been ascertained to be true of Nightingales, Swallows, Swifts, and some other birds.—J. E. H.

always three pairs on our hill every year. Did you know Sr. John Cullum[9] of your part of the world? He was an agreeable, worthy man, & a good antiquary. I was also well acquainted with your late good Bishop Horne:[10] he has often been at my house. I concur with you most heartily in yr. admiration of the harmony and beauty of the works of the creation! Physico-theology is a noble study, worthy the attention of the wisest man! Pray write. Our swifts have behaved strangely this summer: for the most part there were but three round the church, except now and then of a fine evening, when there were 13. They seem to be all gone. House-martins leave Gibraltar by the end of July! I conclude with all due regard.

Yr Humble S.

GIL. WHITE.

[On the back of this letter is endorsed in the handwriting of Mr. Marsham the following description of a "Wall-creeper," which, as will be seen by his next letter he obtained at Stratton:—"Bird 6 inches from Bill end to "Tail tip, and 11 inches from tip of Wings. The Bill very slender, and + "inch long. Body cinnerius. Wings near the Body chiefly red and fading "to near black. The Quill feathers have two large spots, the outmost "white, the lesser yellow. Stratt., Oct. 30, 1792."

In the margin of Mr. Marsham's copy of Willughby's Ornithology, now in the possession of his great grandson, the Rev. H. P. Marsham, a similar description is written.—T.S.]

[9] Sir John Cullum, born 1733, Fellow of St. Catharine's Hall, Cambridge. Rector of Hawstead (1762) and Vicar of Great Thurlow (1774) both in Suffolk. His History of the former parish and of Hardwick Hall forms No. xxiii. of the 'Bibliographia Topographica Britannica,' and was republished in 1813. He wrote also 'Observations on Cedars' and on Yew-trees in churchyards. Died 1785. (Rose, 'Biographical Dictionary,' vi, pp. 507, 508.)—A.N.

[10] George Horne, born 1730, at Otham, near Maidstone, scholar of University, Fellow and afterwards (1768) President of Magdalen College, Oxford; Dean of Canterbury, 1781; Bishop of Norwich, 1790 (Le Neve, Fasti Eccles. Angl. Ed. Hardy, ii, p. 474), died 17th Jan. 1792. A distinguished Hebraist, author of many critical and controversial works, but chiefly known for his 'Commentary on the Book of Psalms.' His life was written by his friend Jones of Nayland. (Rose, *ut supra*, viii, p. 372.)—A.N.

LETTER XIV.

[Marsham to White.]

STRATTON: OCTR. 20. 1792.

MY DEAR SIR,

Ever since i received your very entertaining letter of the 7th. of August, i have had intentions of offering my thanks; but added to *the Demon*, i have suffered other delays from infirmities of old age, such as Rheumatism, &c &c, which make me abhor the sight of a pen & paper. But i am resolved to tell you a piece of Stratton history, viz. my wife has a Turkey that layed 15 eggs, & reared her brood; then she layed 63 eggs, & ceased; & then laid 20, then ceased, & has now laid 8, one on this day, She was of Spring twelvemonth. The old women round us think this extraordinary. Of the Swallows i can only say they left us on ye 18h of Sepr. & on ye 25th we had a large flight appeared & off then a large flight on ye 14 & 15 of Octr. & one Bird on ye 16. One of my men told me yesterday, that he saw a young Cuckow. This for torpidity! Perhaps it was a fern Owl: but that will answer the same purpose, only, you should owe me sixpence for it. I long for your account of that pleasing & harmless bird.—Except the first ten days of August, our Summer has seemed to me very cold & watery.

Sir, as my old friend (for as such i esteem you) you must have been troubled with my Tryals to increase the common ordinary growth of Trees. I have plagued the R. S. more than once on this subject. so i will hope for your pardon for this my half madness. My last tryal has been digging round my Trees. This is a circle as far as the small roots extend from the trunk; & this is done two spades deep. In Beeches about 50 years old, this circle will be about 20 yards diameter. Last Winter i enlarged the circle digged the year before, 8 or 9 yards in diameter, as i found the small roots required it. & the increase of the Beech (at 5 feet) was 3 inches & 2 tenths. Sixteen Beeches of the same age, viz all i had measured except some i had digged round before, produced very little above one inch a Tree. Therefore about 3 to one gained. Now tho' the expense of digging cost much more than the worth of the timber gained, yet t affords me much more pleasure, than i

could have felt, if i had not digged them, as i do not feel the want of the digging money. You see 'tis like Dean Swift in Gulliver of propogating a breed of Sheep with hair instead of wool. But here is no injury, but to self. By the bye i received a letter last post, informing me of a hollow Oak within a few miles of Warwick 55 feet round at 3 feet. I tell you honestly i do not believe it.—I know there is a Baronet of the name of Cullum in Suffulk, but i have never seen him. I have been to very few of the public meetings of Suffolk, & none in these last 50 years.

Octr 30. My infirmities force me to write by instalments, & *Madam Procrastination* will command the use of my pen. My man has just now shot me a bird, which was flying about my house: i am confident i have never seen its likeness before. But on application to Willughby, i conclude it is the Wall-creeper, or Spider-catcher. I find he had not seen it in England.[1] It is very beautifully coloured, 'tho' the chief is cinereous; but the shades of red on the wings, & the large spots of white & yellow, on the quil feathers, are uncommonly pleasing. You see Willughby does not mention them.

I have asked several members for the Report, &c, but yet without success: however, i have a few more in store.—I am surprised that Mr Etty should hear the English language at Canton. If the Chinese can read English, it will be their fault as well as misfortune, if they do not read the Hist. of Selborne. I had the pleasure of recommending a Vol. to Northumberland.—I will not say i am glad you are older, but i may say, i am a gainer, that you had lost the furor which you had in 1756. I believe your people might smell the powder from Bagshot; for i think i have smelt the smoke of London at Windsor; & Gunpowder is more pungent than culinary smoke.

My dear Sir, pray pardon me for saying you ought to love your Spaniel as well as if you still was a sportsman. Dogs deserve to be

[1] Willughby's words are:—" In Anglia nostra eam invenire aiunt, quamvis nobis nondum fuerit conspecta" (*Ornithologia*, 1676, p. 99). Ray Englishes them:—" *They say it is found in* England; *but we have not as yet had the hap to meet with it.*" (p. 143.) Who the authors were who made such an assertion I do not know.—A.N.

loved for their Virtue, more than their usefulness!—You say your Firs have made surprising leading shoots. I last Autumn removed some large Hornbeams & Beeches viz. about a yard round; & they grow well; one of the Beeches has shot 38 inches. I remain, with great esteem, dear Sir, your obliged servant, R: MARSHAM.

Nov. 1st yesterday my Turkey laid her 15th egg. so 113 this year.—I have measured an Oak this day (at 5 feet) which i planted an Acorn in 1719, 8 feet & 6 inches round. I shall be glad to know if the Wall-creeper lives near you.

[Franked by "W. Fellowes," 3d November.]

LETTER XV.

[White to Marsham.]

SELBORNE: NOVEMR 3. 1792.

DEAR SIR,

An extract from the Natural History of Gibraltar by the late Reverend John White.[1]

"In the first year of my residence at Gibraltar which was 1756, it appeared extraordinary to me to see birds of the *Swallow* kind very frequent in the streets all the winter thro.' Upon enquiry I was told that they were *Bank Martins:* & having at that time been but little conversant in Nat. Hist., they passed with me as such for some years without any farther regard. At length, when I had taken a more attentive survey of the physical productions of this climate, I soon discovered these birds to be none of the common *British* species described by authors; & I farther found that they were never seen in G. thro' the whole course of the *summer;* but constantly & invariably made their first appearance about the 18, & 20th, & once as early as the 12th of *Octobr.* & remained in great abundance until the beginning of *March.*

[1] Another extract from this unpublished M.S. was communicated to Daines Barrington, Letter LIII.—J.E.H.

"These phænomena awakened & alarmed my curiosity as events entirely new & unheard of among the body of Ornithologists, & induced me to be particularly exact & attentive in my observations on every part of their conduct. Early in the autumn vast multitudes of these martins congregate in all parts of the town of *Castillar*, which is situate on the summit of a precipice most singularly lofty & romantic, about 20 miles north of *Gibraltar*. Hence it may be inferred that they build & breed on the inland mountains of *Andalusia*, & *Grenada*. But on the approach of winter, when their summer habitations become bleak & inhospitable, (for all those mountains are then usually covered with snow) they retreat to these warm shores, & remain there 'till the snow is gone next spring. A few are always to be seen about our hill by the middle of Octob^r. shifting round to all sides of the rock at times to avoid the wind. Novem^r. 2, 1771, I saw several, with some young ones among them sitting in groupes, on the cliffs, where the old ones came & fed them."

Thus have I, for y^r. amusement, according to promise, sent You an extract concerning this new, & unnoticed *swallow*, which my Brother, with great propriety, in his work has called *Hirundo hyemalis*;[2] & has given several particulars concerning it, & a description of it, too long for the compass of a letter.

Permit me just to hint to You, that I wrote to you some time ago in answer to your last letter, which gave me much satisfaction.

I forgot to mention in the extract, that these *winter Swallows* usually leave Gib. about the beginning of March, unless deep snows (as is sometimes the case, and was particularly so in 1770 & 1772) fall in Spain about that time; & then they linger there till the latter end of the month.

Surely my dear Sir, we live in a very eventful time, that must cut-out much work for Historians, & Biographers! but whether all these strange commotions will turn out to the benefit or disadvantage of old England, God only knows! We have experienced a sad spring, summer, & autumn: & now the fallows are so

[2] In his twenty-second Letter to Pennant, and in the eleventh letter of the present series, the species is named *hyberna*. The above name *hyemalis* possibly is a *lapsus memoriæ*.—J. E. H.

wet, & the land-springs break forth so frequently, that men cannot sow their wheat in any comfort. Our barley is much damaged; & malt will be bad.

Have you read Mr. Arthur Young's[3] "travels thro' France"? He says p. 543, when speaking of the French clergy—"One did not find among them poachers, or fox-hunters, who having spent the morning in scampering after hounds, dedicate the evening to the bottle, & reel from inebriety to the pulpit." Now, pray, who is Mr. Young; is he a man of fortune, or one that writes for a livelihood? He seems to reside in Suffolk, near Bury S. Edmund; so probably You can tell me somewhat about him.

Pray do *wood-peckers* ever damage, & bore your timber-trees? not those, I imagine, of your own planting, but only those that are tending to decay. I had a brood this year in my outlet hatched, I suspect, in the bodies of some old willows. My dissertation on the *Caprimulgus* is almost finished.

I remain, with all due respect, & esteem,

Your most obedient & obliged servant,

GIL. WHITE.

LETTER XVI.

[White to Marsham.]

DEAR SIR,

Our two last letters seem as if they had crossed each other on the road; but whether they conversed when they met, does not appear.

[3] Arthur Young, F.R.S. born 1741, (son of Arthur Young, Rector of Bradfield, Prebendary of Canterbury, and Chaplain to Speaker Onslow) was educated at Lavenham in Suffolk, became a farmer and impoverished himself by rash agricultural experiments. In 1770 he published the 'Farmer's Calendar,' followed by a periodical, 'The Annals of Agriculture,' in which King George III. figured as a contributor. He made many journeys through the British Islands and the continent, collecting information with regard to moral and political economy. On the establishment of the Board of Agriculture he was appointed Secretary. Died 1820. (Rose, *ut supra*, xii, p. 541. Hoefer, Biogr. Génér. xlv, p. 902).—A.N.

If you have got the *Certhia muraria*, or true *Wall-creeper*, you are in possession of a very rare, & curious bird. For in all my researches here at home for 50 years past, & in all the vast collections that I have seen in London, I have never met with it. No wonder that the great Mr. Willughby is not very copious on the subject, for he acknowledges fairly that he had not seen it; tho' he supposes it may be found in this island.[1] The best person I can refer You to is, Dr. *John Antony Scopoli*,[2] a modern, elegant, foreign Naturalist, born in the *Tyrol*, but late deceased in Pavia, where he was professor of Botany. This curious, & accurate writer was in possession of one in his own Museum, & gives the following description of his specimen in his "*Annus primus historico-naturalis:*"—"that it's bill is somewhat longer than it's shanks, slender, & somewhat bent; that the tongue is bifid; & the feet consisting of three toes forward and one behind." Again he adds, "that the upper part is cinereous, the throat whitish; the abdomen, wings in part, tail, & feet, black: the wings at their base, & the quill feathers at their base on one side reddish." "It was taken in Carniola." "It is the size of the common *Creeper*,[3] or *Certhia familiaris:* it's nostrils oblong; tail cinereous at the point; the first four quill feathers distinguished on the inner side by two white spots." He concludes thus,—"Migrat solitario sub finem autumni; turres & muros œdium altiorum adit; araneas venatur; saltitando candit; volatu vago & incerto fertur volucris muta."—You are sure, I trust, that your bird is not the *Sitta Europæa*, or *Nut-hatch*.

I have written so soon, that you may examine yr. bird well again, before the specimen decays. Yr. Lady's Turkey-hen is a most prolific dame; & must, I think, lay herself to death. You persist very laudably in yr. curious experiments on trees. When-

[1] Willughby's observation is as follows:—"They say it is found in England; but we have not had as yet the hap to meet with it." His description of the bird which he calls the Wall-creeper, or Spider-catcher, *Picus murarius*, Aldrov., is borrowed from Aldrovandus, and he places it after the Woodpeckers, and amongst the "Woodpeckers less properly so called." Ornithology, Book II. p. 143., tab. 23).—J. E. H.

[2] Dr. John Antony Scopoli, born 1723, died 1788.—A. N.

[3] This is a slip of White's pen. Scopoli's words (*op. cit.* p. 51.) are "Statura *sittæ*" that is, the size of the Nuthatch, which is nearly true.—A.N.

ever You recommend my book, which begins to be better known, you lay me under fresh obligations. I am writing my account of the Fern-owl, & endeavouring to vindicate it from the foul imputation of being a *Caprimulgus*. My letter will make a fierce appearance with a quotation from *Aristotle*, & another from *Pliny*: but whether the R. S. will read it: or whether afterwards they will print it, I know not.[4]

With all good wishes for your health, and prosperity I remain

Your obliged, & humble servant,

GIL. WHITE.

SELBORNE: NOV^R. 20TH, 1792.

LETTER XVII.

[Marsham to White.]

STRATTON: DEC. 10. 92.

DEAR SIR,

My thanks are justly due to you for the favour of your obliging letter of the 20th. of Nov^r. & for Scopoli's description of the *Wall-creeper*. Although several articles answer exactly, yet i must think him a careless describer. e. g. the Bill is somewhat longer than its shanks; but he does not say the length of either, leaving the reader to suppose what he likes. I tell you the Bill is above an inch, about one tenth. He does not name the hind-claw being above double the length of the fore-claws. Colour has a large share in the beauty of Birds! He says the four quil-feathers are distinguished on the *inner* side with two white spots. These spots are on the *upper* side, & in the two quils next the body; the upper spots are white & the lower are yellow; which he ought not to have overlooked. You will judge better by the

[4] This history of the Fern-owl, so long contemplated and so frequently alluded to, unfortunately it would seem was never completed, the author dying within six months after the date of this letter.—J. E. H.

enclosed painting,[1] than my poor description. A young Lady drew them for me, & they appear to me to be very exact copies, & charmingly executed.

I had occasion to write to the Duke of Portland;[2] & i ventured to recommend the Nat. Hisst. of Selborne to his Grace.

I think there is no doubt, but the R. S. will print your account of the Fern-Owl. If they do not, i (for one) shall be ashamed of F. R. S. to my name. It has been matter of wonder to me, that (since my Indications of Spring were printed) many people have asked me, what is the Fern-Owl? 'Tis a strong proof of the shameful ignorance of a set of people that live great part of the year in the Country!—As you have left off sporting I hope you will not think me too cynical, if i wonder that a rational creature can make the chief pleasure of his life to consist in causing,[3] & seeing harmless creatures in the agonies of death. The poulterer's killing-boy & the Lamb-butcher, follow their trade, & perhaps with pity; the Nobleman's and gentleman's, is clear pleasure: from causing pain & death. I am sorry to find by the Meeting advertised that you have scoundrels & rascals in Hampshire, as we have in Norfolk. Besides the real danger of these villains they confirm the bad opinion i am forced to have of human nature. I may say every man in the village is obliged to me; yet 13 of them are of these Clubs. But they do me one service, viz. they mortify my vanity, as i thought i could have led them all. One man in particular, to whom & his family i had been very kind, i believe to hundreds of pounds; & saved his father from hanging: & this is the grateful return!

But no more on this vile subject. I have just begun a new Wood of some acres, now i am near 85 years old; which i attend

[1] This painting in water-colours has been kindly lent to me by Prof. Bell. It represents with much accuracy two of the primary quill-feathers, the fifth and seventh, I believe, from the left wing of a female or young male *Certhia*, or, as it is now more commonly called, *Tichodroma muraria*, leaving no doubt as to the correctness of the determination of the specimen by Marsham and White.—A. N.

[2] William Henry Cavendish Bentinck, Duke of Portland, born 1738, and twice First Lord of the Treasury, died 1809.—A. N.

[3] No doubt "coursing" was intended.—A. N.

twice a day; & i feel great pleasure in the work. You remember Evelyn's[4] story of the Emperor Maximilian II. asking an old man, why he planted Dates, which would require an hundred years to make them produce fruit? He answered i have children, and i hope they will have children. But having children or none, the work to me is pleasing. Dec. 21. I am interrupted by the friend that directs this, & can only add that i am always, with great esteem, your obliged & obedient servant, R: MARSHAM.

[This letter was franked by "Suffield."—21st December.]

LETTER XVIII.

[White to Marsham.]

SELBORNE. JAN. 2.
1793.

DEAR SIR,

RAIN IN 1792.	Inch. Hund.
Jan.	6–7
Feb.	1–68
Mar.	6–70
Apr.	4–8
May	3–0
Ju.	2–78
July	5–16
Aug.	4–25
Sep.	5–53
Oct.	5–55
Nov.	1–65
Dec.	2–11
	48–56

My best thanks are due for your kind letter of Decmr. 21, to which I shall pay proper attention presently. But I shall first speak of the margin of this, which contains the rain of last year, which was so remarkably wet, that You may be perhaps glad to see what proportion the fall of water bears to that of other uncomfortable, unkindly years. The rain in 1782, as you see in my book, was 52 inches; in 1789, 42 inches; & in 1791, 44 inches: yet these wet seasons had not the bad influence of last year, which much injured our harvest; damaged our fallows; prevented the poor from getting in their peat & turf, which lies rotting in the Forest; washed & soaked my cleft beechen wood, so that it will not burn; it prevented our fruits from ripening. The truth is, we have had as wet years, but more intervals of warmth and sun-shine.

[4] Vol. ii. p. 206. Hunter's edition (*ut supra*).—A.N.

I am now perswaded that your bird is a great curiosity, the very *Certhia muralis*, or *Wall-creeper*, which neither Willughby nor Ray ever saw; nor have I, in 50 years attention to the winged creation, ever met with it either wild, or among the vast collections that I have examined in London. It seems to be a South Europe bird, frequenting towns, & towers, & castles: but has been found, but very seldom indeed, in England.[1] So that you will have the satisfaction of introducing a new bird of which future Ornithologists will say,—"found at Stratton in Norfolk by that painful, & accurate Naturalist, Robert Marsham, Esq."[2] You observe that Scopoli does not take notice that the hind-claw is about double the length of the fore-claws: but Linnæus corroborates your remark by saying "Ungues validi, præsertim posticus." You seem a little to misunderstand Scopoli respecting the spots on the *inner-side* of the quill feathers: by the *inner side* he does not mean the *under side* of the wing next the body; but only the *inner* or *broader web* of the quills, on which those remarkable spots are found, as appear by the drawing. I am much delighted with the exact copies sent me in the frank, & so charmingly executed by the fair unknown, whose soft hand has directed her pencil in a most elegant manner, & given the specimens a truly delicate, & feathery appearance. Had she condesended to have drawn the whole bird, I should have been doubly gratified! It is natural to young Ladies to wish to captivate men: but she will smile to find that her present conquest is a very old man.

My best thanks are due for all your good offices respecting my work, & in particular for your late recommendation to the Duke of Portland.

You did not in y^r^ last, take any notice of my enquiries concerning *wood-peckers*, whether they ever pierce asound tree, or only those that are tending to decay.[3] I have observed that with us they love to bore the edible chest-nuts; perhaps because

[1] This statement, no doubt, is founded on Willughby's observation before quoted. See *antea* p. 184 note 1.—J. E. H.

[2] A prophecy singularly verified after an interval of more than eighty years.—J. E. H.

[3] The ability of the Green Woodpecker to pierce sound timber, has been placed beyond doubt by the testimony of more recent observers.—J. E. H.

the wood is softer than that of oak. They breed in my outlet, I think in old willows. You have not told me anything about Arthur Young. You cannot abhor the dangerous doctrines of levellers & republicans more than I do! I was born & bred a Gentleman, & hope I shall be allowed to die such. The reason you having so many bad neighbours is your nearness to a great factious, manufacturing town. Our common people are more simple-minded & know nothing of Jacobin clubs.

I admire your fortitude, & resolution; & wonder that you have the spirit to engage in new woods, & plantations! Our winter, as yet, has been mild, & open, & favourable to your pursuits. Pray present my respects to your Lady, & desire her to accept of my best wishes, & all the compliments of the season, jointly with yourself. I have now squirrels in my outlet: but if the wicked boys should hear of them, they will worry them to death. There is too strong a propensity in human nature towards persecuting & destroying!

I remain, with much esteem, Your's, &c.

GIL. WHITE.

LETTER XIX.

[Marsham to White.]

STRATTON. FEB. 20

93.

DEAR SIR,

After offering you my hearty thanks for the favour of your pleasing & instructive letter of the 2d of Jan. i must beg your pardon, for omitting the two articles you had mentioned to me. Indeed i thought i had answered them.—I suppose the wood-peckers do not attack the sound part of a tree; but where a bough has been broke off, & the stump died, & remained some years on the tree before it was broken off; then when the bark skins over the rotten part, these birds attack the skin over those false

parts, where they find the holes almost ready made for their use. Several of the edible chesnuts that i have planted, have the wood-peckers holes in them; which i think i remember to have been dead stumps. But i am not certain.—As to Arthur Young, i never saw the man; but by the accounts of others, & from what i have read of his works, i conclude him an abominable coxcomb. We have a story of him, that a foreigner a Russian curious in husbandry, went to see him in Suffolk he not being at home, the stranger enquired of his wife, how many acres of potatos he had that year, to fatten his swine i think 500? She answered none! They did not use potatos.—He, you know, gives some descriptions of Noblemen's & Gentlemen's houses, & places. Several of which i have seen, where he is very erroneous.—I had minuted down some articles of his observations, & a friend told me, that no dependance could be had on his veracity. Lies in a pettyfoging writer, such as Farmer Young, do not signify much (tho he is a voluminous man) But when you find men of fame dealing in lies, or false quotations (which are the worst of lies) they are shocking to an honest mind. Evelyn, e.g who had perhaps a larger share of it, than he deserved, abounded with both. But Addison's false quotation from Bp Burnet's travels[1] offends me most, as it gave occasion to others to abuse the Bp for lying. I conclude Addison was drunk in the evenings when he wrote his Travels; but as they passed several Editions both he & Evelyn, should have had the honesty to have corrected their errors as a duty they owed to the public.—I wish your friend Daines Barrington was not sometimes inaccurate. e. g. in his zeal against the migration of birds, he urges an instance which makes directly against his opinion. viz if Wood-cocks crost the Sea, they

[1] It would seem that Marsham's memory had deceived him and that he must have been thinking of some other author than Addison, whose character cannot be affected by what is above said of him. I have examined his 'Travels' without being able to find therein any reflexion on Burnet, to whom, indeed, as the Rev. W. Elwin has kindly pointed out to me, a high compliment is paid in the preface: —"Among the authors of our own country we are obliged to the Bishop of Salisbury [Burnet] for his masterly and uncommon observations on the religion and governments of Italy." Mr. Elwin, and there can be no better authority, is fully persuaded of the groundlessness of the charge against Addison. Nor can that against Evelyn be maintained. Marsham's advanced age must be his excuse.—A. N.

would beat themselves against the Lighthouses. This, i am well informed, they do, every Autumn in Norfolk. And he is unlucky when he names the yellow-hammer in Hasselquist's ship;[2] one is left to suppose the only bird; when you may remember Hasselquist mentions many different birds, on different days, but forgets the poor yellow-hammer.—Mr Barrington concludes Monsr Adanson's birds to be martins, *because they roosted on the Sea-shore.*—But Adanson says after, when he lived by the Gambia, *great numbers of European Swallows came every evening into his hut, & past the night upon the rafters.* Now if these birds roosting on the sands proved them martins, does not their roosting on the rafters prove them swallows? From pieces of quotations you may prove blasphemy from the Bible, as you may remember finely proved by Pulteny (afterwards E. of Bath) against Thomson in the H. of Commons.[3]—I honour & love Mr Barrington; but i wish every man i love would be careful of what he commits to the public notice. Your friend Pennant has been too careless.

I thank you for your account of the rain of last year, as i do not measure it, i could only observe there has fallen a great deal. If the Squirrels did you as much harm as they do me, you would think your self obliged to the boys that destroy them. I paid for above 80 one year. They bite off the young shoots of my Trees.—Indications of Spring in 1793. Snowdrop Jan 15. Thrush sings Feb. 15. Hawth. l. Mar. 2. Ringdoves coo Feb. 22. Rooks build & stock doves coo Mar. 4. Hipatica F. Feb. 16. Yellow butterfly Feb. 24. Larch l. Mar. 9

I hope you have presented your account of the fern-owl to the R.S. I am hungry for it. I am glad you liked the drawing of

[2] Hasselquist, born 1722, died at Smyrna in 1752. His journal and other literary remains were published by Linnæus, and afterwards translated into English :—'Voyages and Travels in the Levant, &c.' (London: 1766.) The bird Barrington (*Phil. Trans.* 1772, *p.* 276) referred to as a Yellow Hammer was most likely that which Hasselquist himself called *Emberiza africana* (pp. 14 and 206 of the English translation) and identified by Linnæus with his *Loxia chloris* (Syst. Nat. Ed. 10, i. p. 174, no. 20), *i.e.* our Greenfinch.—A. N.

[3] This allusion is quite beyond me, nor can Mr. Elwin throw any light upon it.—A. N.

the two feathers, I hinted my wish for the whole bird; but she lent a deaf ear: & in that manner, all young Women have treated me (when i ask favours) since i was turned of 40.

I congratulate you upon the cheque given to the cruel french,[4] & remain with great esteem my dear Sir, your most humble & obliged servant,

R. MARSHAM.

N.B. you see the mournful power the Hag has over me. Feeling my hand not very shaking, i begin a letter & write 'till i am weary; lay it by, and wait 'till i feel myself willing to write again. So i have sometimes found more than a month slide away, before i seize my pen again. My strong comfort is that nobody suffers by my infirmity but myself. 'Tis like drinking; which 'tho' not my weakness, i think very pardonable in those under its influence. Mar. 15. this day Toads sing. I cannot remember a Winter having passed more mildly than the last.

In the Gent. Magazine of last Feb. is a letter[5] against the

[4] Towards the end of the preceding year Frankfurt had been retaken by the Germans and the French compelled to recross the Rhine.—A. N.

[5] The reason why Marsham attributed this letter to Gilbert White no doubt was that the writer had signed himself "A Parish Priest," and had stated that his house was "about thirty miles from the sea-coast of Hampshire." On the other hand it is evident that White as it will presently be seen disclaimed the authorship because the observations of the writer in regard to the supposed torpidity of Swallows were inconsistent with the views which he himself had expressed in his book. See Letters X, and XXXVIII, to Pennant; and Letters IX, XII, and XVIII, to Daines Barrington.

Who then was the writer of this letter? Not Dr. Stephen Hales, for altho' at one time he resided about the same distance as White did from the seacoast of Hampshire, he died in 1761, or more than thirty years before the letter in question was dated.

Apropos of letters in the "Gentleman's Magazine" attributed to Gilbert White, it is perhaps not generally known that in the volume of that periodical for 1781, appeared a letter under the signature "V," (since proved to have been penned by White) in which an interesting account is given of the writer's college acquaintance at Oxford with the poet Collins.

In the Memoir prefixed to the Aldine edition of that poet's works (p. xxxi), the editor has reprinted this letter entire, prefacing it with the following remarks:—

torpidity of Swallows. Symptoms point as if it might be written by you. I had the lie about the toad in the block of stone in the Phil. Trans. fairly detected.[6] But i have also a proof of torpidity of Swallows in Yorkshire, that i cannot doubt. If you wish for the particulars, i will transcribe them for you. Again Adieu.

LETTER XX.

[White to Marsham.]

SELBORNE: JUNE 15.
1793.

DEAR SIR,

From my long silence You will conclude that Procrastination has been at work, & perhaps not without reason, But that is not all the cause: for I have been annoyed this spring with a bad nervous cough, & a wandering gout, that have pulled me down very much, & rendered me very languid, & indolent.

As you love trees, & to hear about trees, You will not be displeased, when You are told that Your old friend the great *Oak* in the *Holt* forest is, at this very instant, under particular circumstances. For a brother of mine, a Man of Virtù, who rents Lord Stawell's beautiful seat near the Holt, called *Moreland*, is at this

"It is here printed from the original manuscript, addressed "For Mr. Urban. To the care of Mr. Newbery, at the corner of St. Paul's Churchyard, London." The letter bears the 'Alton' postmark, and is from the pen of Collins's college acquaintance Gilbert White, the celebrated author of the Natural History of Selborne."—J.E.H.

[6] I am unable to find any reference to this circumstance, nor can Mr. White the Assistant Secretary of the Royal Society, who has kindly made search for me, throw any light upon it.—A.N.

very juncture employing a draughts-man, a French Refugee, to take two or three views of this extraordinary tree on folio paper, with an intent to have them engraved. Of this artist I have seen some performances; & think him capable of doing justice to the subject. These views my Brother proposes to have engraved, & will probably send a set to You, who deserve so well of all lovers of trees, as You have made them so much your study, & have taught men so much how to cultivate & improve them.—I have told You, I believe, before, that the great *Holt Oak* has long been known in these parts by the name of the *grind-stone* Oak, because an implement of that sort was in old days set up near it, while a great fall of timber was felled in it's neighbourhood.

After a mild, wet winter we have experienced a very harsh, backward spring with nothing but N. & N.E. winds. All the *Hirundines* except the sand-martins were very tardy; & do not seem even yet to make any advances towards breeding. As to the sand-martins they were seen playing in & out of their holes in a sand-cliff as early as April 9th. Hence I am confirmed in what I have long suspected, that they are the most early species. I did *not* write the letter in the Gent. Mag. against the torpidity of swallows: nor would it be consistent with what I have sometimes asserted, so to do. As to your recent proof of their torpidity in Yorkshire, I long to see it. But as much writing is sometimes irksome, cannot You call in occasionally some young person to be your Amanuensis?

There has been no such summer as this, so cold & so dry, I can roundly assert, since the year 1765. We have had no rain since the last week in April, & the two first days in May. Hence our grass is short, & our spring-corn languishes. Our wheat, which is not easily injured in strong ground by drought, looks well. The hop-planters begin to be solicitous about their plantations. Here I shall presume to correct (with all due deference) an expression of the great Philosopher Dr. Derham. He says in his Physico-theology, "that *all* cold summers are wet:" whereas he should have said *most*.

Have You seen Arthur Young's "*Example* of *France* a *warn-*

ing to *England?*" it is a spirited performance. The season with us is unhealthy.

With true esteem

I remain, Y^r^ obliged servant,

GIL. WHITE.

[At the head of this letter is the following note in the handwriting of Mr. Marsham :--

"This worthy man died this month." His death took place on the 26th of June, 1793.—T.S.]

IV.

NOTES ON THE NESTING HABITS OF CERTAIN BIRDS, AND REMARKS WITH A VIEW TO THEIR ENCOURAGEMENT BY THE ERECTION OF NESTING BOXES.

BY FRANK NORGATE.

COMMUNICATED BY H. D. GELDART.

Read 1st March, 1876.

IN the following paper I wish to call attention first—to certain facts with regard to some species of birds, which, through the mistaken zeal or vulgar prejudice of game keepers and gardeners, are too frequently destroyed in this country, secondly to the encouragement of these and of other birds by the use of suitable nesting-boxes, and thirdly—to the nesting habits of different birds, a knowledge of which, will be of service in providing suitable shelter and protection for them during the breeding season.

Of many birds unjustly persecuted, perhaps none is more truly the friend of man than the Barn Owl. It is to be regretted that Barn Owls as well as other Owls have been accused of killing young pheasants night after night at the same pheasant coops.

Possibly Owls do occasionally, but rarely, take a disobedient

young pheasant who is determined to be out late in spite of the warnings of its chucking mother. Possibly the Owl which has taken one pheasant may return to the same coop night after night or earlier in the evening than the usual time "when Owls do cry."

One Barn Owl certainly acquires a taste for rats, and rats only. Another has a taste for mice, and only mice. I once counted as many as twenty good sized rats in the nest of a Barn-Owl: the weather was very hot at the time, and the rats were all so fresh that they must have been killed during the previous night. On another occasion I counted about twenty mice in a Barn-Owl's nest, but as part of the nest was inaccessible, there were perhaps more mice out of sight in the hollow of the oak tree. Many similar instances could be cited. I have probably examined about thirty Owl's nests, but do not remember ever finding the remains of game birds in any of them. Rats are dreadful vermin for eggs and young birds, and will rob the coops as long as there is a young pheasant, chicken, or duckling, to be had. I have known one old rat to carry off fourteen young ducks in about three days; the rat was killed, and the little ducks' legs were found in her possession. Now, if a pair of Barn-Owls kill twenty rats in one night, surely the Owls do more good than harm to the game preserves!

Much the same may be said in favour of the Tawny and the Long-eared Owls, although they do more frequently kill game. If an Owl for want of its usual food acquires a taste for game, let *that* Owl be killed, and no other; protect the coops by all fair means, but do not wage war against all Owls for the offence of one, and remember, in nine cases out of ten, the Owls that frequent the pheasant coops are there with the intention of catching *rats* or *mice*, which rats and mice prey on the young birds and their food, So much for the Owl's character.

There are in this country gentlemen who wish to encourage Owls as well as Titmice, and have prepared towers, lockers in barns, and tubs in trees for that purpose. But in several instances the game keepers persist in slaying the Owls in spite of their employers' wishes; they may perhaps know how to encourage Wild-fowl, Snipe, and Wood-cock as well as game; but they seize every opportunity of destroying almost every wild bird, beast, and reptile that is not game.

We were once beating some plantations with a party of game-

keepers and helpers, each with stick in hand, searching for the first laid pheasants' eggs, to put under hens. Whenever we found a small bird's nest it was knocked over with a stick by order of the head keeper, unless I happened to want the eggs for my own collection. The Warblers' nests shared the same fate as the Greenfinches', and the gamekeepers' reason for this was that the Warblers did harm in a neighbouring fruit garden. We found three Nightingales' nests which I tried to defend, one especially was so near "the house" that it seemed a great pity to destroy it, but the gamekeeper was inexorable and said—"We don't want the vermin to keep the pheasants awake all night."

The Heronry at Herringfleet, where I well remember seeing as many as six nests in one tree, no longer exists, and the gamekeeper who has been there nearly six years, tells me that a year or two before he came, his predecessor shot the Herons from their nests and hung them up to produce maggots to feed the pheasants on! I believe the owner was very much annoyed and discharged the keeper, but it is probably impossible to reinstate the Herons.

Many gardeners object to encourage in gardens such birds as Sparrows, Blackbirds, Thrushes, and one or two other birds hereafter to be mentioned, because they destroy so much fruit; but the making of suitable nesting boxes is not necessarily encouraging them, for if a Sparrow nests in a box, the nest and Sparrows are much more easily destroyed than if the nest was under the tiles of a house. Leaving the Blackbirds and Thrushes to take care of themselves for the present, for they are numerous enough, I must say a word or two in favour of the Titmice; they are accused of picking out the buds of the gooseberry bushes and other fruit trees. I have watched these birds picking most actively, apparently picking the axillary buds from the topmost shoot of a gooseberry bush: on examining this top sprig not a bud was missing but a few minute insects (*aphides*) were left on it, and it is to be hoped that the Blue tit returned for another meal.

Buds are picked out by Bullfinches; primroses and crocuses* are decapitated in spring by House Sparrows in the early morning; and peas are destroyed by House Sparrows and other finches. The seed peas are taken out of the ground by long tailed Field-mice. There are many people who not only believe in the utility of our

* I am indebted to Mr. Henry Stevenson for this note on Crocuses.

wild birds but are much interested in encouraging those which may be easily induced to nest and rear their young in boxes where they may be closely observed and also protected from their usual enemies. It is the custom in Switzerland and other parts of the continent to encourage Titmice and other small birds to nest in boxes fixed against trees.

If people would fix suitable boxes on their bedroom window sills, or any other convenient place they might not only derive much amusement from watching the Blue Tits and their "large little family" of from nine to fourteen young ones, and examining the nest (which, so far as my experience goes, is always scented with the smallest, almost invisible, bits of green mint or other strong scented plant, and generally ornamented with plenty of coloured wool), but they might also find out by counting, how many hundred green caterpillars are brought daily to be swallowed by the fourteen hungry young tits; let the observer beware, however, lest he mistakes the green grubs for small green gooseberries or buds.

Most of the Titmice and other birds which nest in boxes become very tame, and may be taken off the nest by the hand in order to examine the eggs; but the Blue Tits need be held during the examination or they will sometimes fly straight on to the nest again.

It is a good plan to remove all the old nests and clean out the boxes soon after the young have flown, and the boxes should be again cleaned out in the spring as the Titmice roost in them during the winter. My boxes are frequently occupied by other tenants than birds. Long-eared Bats take possession of some, others are partly filled with acorns, or with nests of the Long-tailed Field Mouse, which may then be easily caught and destroyed if troublesome; and in some I have found small and very beautiful nests of both Hornet and Wasp; these nests were about the size and shape of half opened moss roses, and were suspended by short stalks. They contained few grubs and did not appear to be guarded by more than one owner to each nest, so that in this young state they are easily destroyed or removed to the cabinet.

As to the position and construction of boxes, the following notes may be of service to those who wish to encourage birds in this way.

If the boxes are placed within five or six feet of the ground it is easy to examine and clean them, but they are less likely to be disturbed by accident or by such enemies as boys and cats if they

are placed at a considerable elevation. The boxes should be firmly fixed, so that they cannot be easily shaken by the wind or by the weight of the birds.

At a height requiring a ladder it is very troublesome to fix the boxes in the first instance, and afterwards to examine and repair them. Old pump trees and hollow larch poles make excellent nesting places for Wrynecks, Nuthatches, Tits, Redstarts, &c.

The posts should be planted in the ground. A tight fitting bung should be thrust down the hollow to the depth of about two feet from the top of the post; a strong lid and padlock, or other fastening fixed to the top and a hole made through the side of the post about two inches below the lid. The hole may be conveniently bored with a carpenter's "sway-bit;" it should slope slightly upwards from the outside to the inside so that the rain may not run in. The holes should be made carefully of the exact size for the bird required to use them.

For the Tree Creepers and the smaller Titmice, the holes should be three quarters of an inch, and one inch respectively, so that House Sparrows cannot enter. For Great Tits, Wrynecks, and Nuthatches the holes should be one inch and a quarter in diameter, or not large enough for Starlings. Good boxes may be made of inverted flowerpots fitted loosely on the tops of posts, the top of the post should be hollowed out enough to contain the nest when the flowerpot is removed for examination, and should have a "shoulder" cut to prevent the flowerpot from fitting down too tight, otherwise, in wet weather the post will burst the pot. The hole in the flowerpot must be stopped with a cork and another suitable hole cut in the side of the pot with a hard chisel, and rounded with a rasp.

Rectangular wooden boxes should be made of "inch stuff" with the back projecting so that nails may be used for fixing the boxes to walls, sheds, or posts; they do not improve the appearance of trees. The following birds occasionally nest within two or three feet of the ground—Starling, Great Tit, Cole Tit, Marsh Tit, Blue Tit, Tree Creeper, Nuthatch, Wryneck, and Tree Sparrow. The House Sparrow generally builds at least ten feet from the ground. The late Mr. John Savory of Sparham told me of Rooks nesting in some tall laurels at Blakeney after the trees in the rookery had been felled.

It may not perhaps be generally known that at least fourteen,

and probably many more different species of wild British birds may be easily induced to nest in boxes or suitable holes made in dead wood, or in old walls where a loose brick may be taken out, and a tight fitting wooden lid may be wedged in; one of the upper corners of the lid should be cut off to form an entrance. Six-gallon casks in trees, and lockers in barns, are attractive to Owls, but Starlings are apt to usurp them. In a barn in this neighbourhood there were two nests of white Owls at one time; there is merely a wooden shelf with a raised ledge placed under the owlet holes in each gable, these shelves were covered with pellets of rats felt on which the eggs were laid.

The Tawny Owl is said to prefer those casks which are placed in ash trees and elms; and the Barn or White Owl those in elms and oaks. The following birds are fond of nesting on shelves or ledges, in summer houses and open sheds, or on trelliswork, or on trees trained against walls:—Spotted Flycatcher, Pied Flycatcher, Missel-thrush, Songthrush, Blackbird, Redbreast, Redstart, Pied Wagtail, House Sparrow, Chaffinch, Goldfinch, Greenfinch, and probably many others.

It is likely that all those birds which naturally nest in holes not of their own making might be induced to build in boxes; for examples, the Marsh Tit, Tree Sparrow, Jackdaw, and Chough, (where that bird occurs in villages, as in some parts of Wales where it still nests in churches,) also other birds such as Woodpeckers which usually bore their own holes for nesting. Starlings, and great Bats often take possession of Woodpeckers' nesting holes.

Gardens and shrubberies may, with very little trouble, be rendered highly attractive to birds in a state of nature, without in any way detracting from their appearance, but rather the reverse. Some gardens and shrubberies are, of course, much better suited for the wants of many species of birds than others are. There should be variety of soil and of trees, and rough ground and water, coniferæ for the Goldcrested Regulus, long grass in the shrubbery or around the apple trees, may be left to grow for the Partridges, Tree Pipits, and Willow Warblers, and this grass may be greatly ornamented by sticking into it all the hardy bulbs that can be spared, such as snowdrop, crocus, hyacinth, &c. Holes may be pierced with a stout walking stick, they should be about nine or ten inches deep, and a single bulb dropped into each. A furze

bush or a large tuft of pampas grass is a good nesting place for the Chiff-chaff; brambles, ivy, periwinkle and clematis for Nightingales and other warblers.

Many birds become so much attached to a certain spot that when their nests are destroyed they rebuild them in the same place five or six times in the season. A Goldcrested Wren's nest was suspended from the end of a branch of red cedar on our lawn, so low that it was injured and the eggs knocked out by the hats of the croquet players, but the birds twice rebuilt it in vain, leaving the two injured nests hanging from the bottom of the new nest, and then built two more nests in succession the last of which was placed high up against the stem of a cedar of Lebanon.

There is here a certain forked branch of a pear tree which has been chosen as a site for a Missel Thrush's nest annually for at least thirty years, with only about three exceptions; a nest begun there last year, was soon forsaken and another built up on an apple tree a few yards off. Either the eggs or the young are invariably destroyed.

The Hawfinch, which is rare about here, nests almost every year on a certain bough on an apple tree near Sparham. I myself have only seen these Hawfinches' nests in three or four different years, but I am told that the nest is always on the same bough of the same tree, and that one, and frequently both of the old birds are usually shot from the nest, and the young or eggs destroyed. How is it that this particular branch should be so attractive to a bird so uncommon as the Hawfinch is here? In spite of this persecution there have been more Hawfinches noticed here during the last two years than in former years. Most birds, if their nests or eggs be destroyed, will immediately nest again generally in a safer spot unless the nest be taken clean away during their absence in which case they will usually build again in the same or an equally unsafe place. Some hen birds such as the Blackcap, if the nest be removed immediately after the young are flown, will in a few days build again, sometimes on the very same twig, leaving the cock bird to rear the first brood.

Many birds will nest and lay ten, twelve, or more sets of eggs in succession if they are continually robbed, and some such as the Greenfinch and Ringdove may be found nesting from April to October.

In our garden which only contains about one acre of ground, few trees and no water, we generally have the following birds nesting in boxes and other snug corners;—Spotted Flycatcher, Songthrush, Blackbird, Redbreast, Redstart, Great Tit, Blue Tit, Cole Tit, House Sparrow, Starling, Wryneck, Tree Creeper, Wren, Nuthatch, Swallow, and House Martin; besides others nesting in trees, bushes, and on the ground, viz.—Missel Thrush, Songthrush, Blackbird, Hedge Warbler, Golden crested Regulus, Blackcap, Garden Warbler, Whitethroat, Lesser Whitethroat, Willow Warbler, Longtailed Tit, Chaffinch, Goldfinch, Greenfinch, House Sparrow, Tree pipit, Ringdove, Redlegged Partridge, and common Partridge. Many other species of birds might easily be had if the garden was larger and had in it a stream or a pond, and a rough plantation and a sand pit.

Sand martins and Kingfishers may be enticed by making a sand pit even when there is no water within half a mile of the spot. Near our garden was a dry pit entirely over-grown with weeds and brambles; some men in digging marl exposed a few square feet of sand in the side of this pit, two or three days afterwards a pair of Kingfishers bored into this sand and laid their usual complement of seven eggs, although the men were still at work in the pit, and the nearest water (a small ditch) was about half a mile off. Still nearer our garden a few loads of sand were taken out of a field making an excavation about six feet square and only three feet deep; a few days after this was made, twenty pairs of sand martins bored into and nested in it. Tree sparrows also nest in the side of a pit near some cottages in Sparham.

Swallows are fond of nesting inside open buildings such as barns, stables, sheds, and under bridges; they also build inside such chimneys as have ledges about three feet below the top. House martins generally build under the eaves if there is suitable clay or mud in the neighbourhood, except when whitewash or other colouring matter prevents their nests from adhering to the wall by flaking off from the wall with the nest; these birds seem to be rather particular about the shape of the eaves, and I think they nest more abundantly near the sea cost than inland.

In a cart shed near our house there are square holes on the wall-plate round two sides of the shed, these holes, which are merely the spaces left between the ends of the rafters, once contained eight

Robins' nests in a row, but only two of these nests had eggs in them; they were all forsaken and a brood was hatched in a more favoured spot just outside the shed.

Pied wagtails and spotted Flycatchers sometimes build in or upon other birds' nests. We had here a Wagtail's nest built in a Blackbird's nest and containing a Cuckoo's egg as well as the Wagtail's eggs.

Some birds use extraordinary materials for their nests.—A Missel Thrush once made a nest here almost entirely composed of thin strips of green and white paper which had been hung up to scare sparrows from a seed bed. Thrushes' nests have been recorded which were built with string, lace and linen collars, &c. On one occasion I had turned out of my collection a pair of stuffed Squirrels, which the gardener placed near some fresh sown peas to scare the enemy. (I think he had a very vague idea as to whether the dreaded enemy was a mouse or a titmouse.) For some days afterwards it was quite amusing to see a pair of great Tits plucking the stuffed Squirrels in order to line their nests with the red fur, these birds seem to prefer red fur or the rust coloured cottony down from the seed of the reed mace to anything else for lining or even for the entire structure of their nest 'though they sometimes use rabbits' felt or moss.*

I have called attention to gardens chiefly because it is so much easier to protect the nests in gardens than elsewhere, and, because being close at hand, the nests may be watched and frequently examined at odd times, when one has not time enough to spare for a day's "birds' nesting" at a distance.

A great number of different birds may be encouraged even in towns and cities. In the summer of 1861, I found twelve species of birds nesting in and upon the Norwich Cathedral, but none of these were Titmice or Hawks, although I believe both the Peregrine Falcon and the Kestrel nested there formerly, and probably several Tits nest there now. Pied Flycatchers, Jackdaws, and Choughs (already alluded to above) are fond of nesting in buildings such as

* A moorhen's nest which I found on an islet of pebbles in the river Earn, was composed entirely of dead beech leaves and stones. Another moorhen's nest (noticed in the Field newspaper) was said to be ornamented with scarlet anemones round its edge.

churches and ruined towers, where they may in some cases be easily protected.

Ponds, lakes, and islands, even of small extent and in frequented places may be made the home of birds, thus greatly adding to their interest, by a few simple arrangements for their safety, and convenience.

There is in a farm yard in this county, a pond at which the farm horses drink daily. At some distance from the edge of this pond, about a dozen posts were stuck in the water, each post supporting a small ladder and a box shaped like a small dog kennel. These boxes were all tenanted, some by Moorhens and others by tame Carolina Ducks. Around the pond was an embankment of sand and gravel in artificial holes in which several pairs of tame Shellducks had nests. In a bed of nettles, between the water and the sandbank, was a nest of hybrid eggs, of tame Canada Goose and a wild Bean Gander (a winged bird), these eggs were I believe all rotten. On the other side of the sandbank was a hollow tree containing a nest of Carolina Duck's eggs. Here were also plenty of half tame Wild Ducks which were said to nest on pollard trees at some distance for want of a more suitable place, and to pay daily visits to the sea.

Many foreign and domestic birds such as Parrots, Carolina Ducks, Musk Ducks, Rockdoves, &c., nest freely in hollow trees or boxes, and are both ornamental and interesting.*

In Lapland the natives and settlers are said to place boxes in trees on the banks of rivers for the Golden-eyed Ducks to nest in.†

There is in Norfolk a group of small islands well wooded with fir trees where the birds are but little disturbed. On the afternoon of the 21st of May, 1874, I spent about two hours in these islands, and found in that short time ten nests of the golden crested Regulus besides other nests of Moorhen, &c.

The nest of the tree Wasp has also been found suspended from the bough of a fir tree in these islands, and I have frequently found here nests of Kingfisher, Kestrel, Creeper, and others. Islands whether they be only a yard or two in diameter, and situated in a

* Sometimes two nests of stockdoves are found in the same hole at the same time.

† Richard Dann and Linnæus cited by Yarrell. Hist. Brit. Birds, Vol. iii. p. 268.

daily disturbed duck pond, or larger and perhaps well wooded islets in a lake are excellent spots for preserving many species of wild birds during the breeding season.

The strips of pebbly beach which are exposed in the shape of islands in summer time in some of the highland rivers, are favourite nesting places for the Oystercatcher and other birds, although they are perhaps many miles away from the sea.

In the Perthshire lochs, the little islets covered with evergreen Blaeberry, and Rhododendron, and two or three Scotch Pines or Birch trees, are frequently chosen by the Woodcock, which appears to have two broods in the highlands; the first brood is said to fly by the 1st of March.

The Crossbills are equally early, and so are the Longeared Owls even in Norfolk. This latter bird has a habit of laying its seven eggs on the outside of the Squirrel's deserted drey; the birds both sitting at once. In May, 1873, Mr. Overman told me that his attention was once called by a woodcutter to a lot of Horned Owls, all perched on one Scotch Pine at Stratton Strawless; he was much astonished at seeing so many together and determined to try and count them. Not being able to count them as they sat, he tried in vain to make them leave the tree by knocking it or throwing things up at them; at last the woodcutter went away and fetched a gun which was fired under the tree. My friend was then still more astonished at the sight of about fifty Owls on the wing, but he was unable to count them. I should be glad to know if anyone else has ever seen more than a single family of Owls in one tree. The Short-eared Owl migrates, but is I believe, generally flushed from the ground.

The late Mr. Smith, owner of the Scilly Isles, was so successful in preserving the interesting fauna of his property, that the Green Cormorants, which on the neighbouring coasts of Dorsetshire, Devonshire, and the most frequented parts (*i.e.* the southern coast) of Cornwall are about the shyest of all sea fowl, on the Isle of Rose Vere allowed me to take them by their necks from the ledge on which they sat like so many claret bottles, the others still remaining as if they were too lazy to fly or dive without help. The old and the full sized young ones seemed equally tame, but they used their beaks with such painful effect, that after carrying three at once to the water to see them dive, I left the others in peace.

Like Moorhens the Cormorants use their wings under water in diving much as they do in flying, except that they both use the carpal joint rather more than the rest of the wing.

The Puffins were nearly as tame as the Shags. The Petrels, of course, remained in their holes all day. Almost all the sea birds were so tame that I could distinctly see the colours of their legs and bills, and a large Seal followed our boat so closely that we heard it breathing and saw the water dripping from its head.

Some birds such as Grebes and Coots seem to prefer nesting in still water, others such as the Water Ouzel and Sandpiper like running streams best. I once found four eggs of the common Sandpiper laid on some loose gravel in a garden in Perthshire; two small streams (the Shaggy and the Turret) run through this garden.

My thanks are due to Mr. Henry Stevenson for helping me to arrange the above notes, which were originally written in a different order and for another purpose.

V.

ORNITHOLOGICAL NOTES FOR 1875.

By Henry Stevenson, F.L.S.

Read 1st March, 1876.

Wildfowl and the Winter of 1874-5. The first week of the new year, after the intense severity of the previous month, commenced with so rapid a thaw that in a few hours the heavy fall of snow on the ground had disappeared as if by magic; and the temperature had become warm and spring like. Fieldfares and redwings had all disappeared from the neighbourhood of the city, and our resident thrushes and robins, as if they had known no privations, were singing as in February.

But little fowl remained on the coast, or inland, after the frost of

December; and throughout February, with the exception of a few duck and mallard and some pochards, fowl were scarce in our markets. Snipe and woodcocks were equally so, and though a second winter of frost and snow set in about the 25th and lasted into March there was a dearth of all kinds of birds worthy of notice. Early in March, however, a large quantity of fowl made their appearance on Breydon, apparently waiting for the second batch of hard weather to "break up" before proceeding northwards, and about the same time a good sprinkling of woodcocks was remarked in west Norfolk.

A single Bewick's Swan was sent to Norwich about the middle of January, and a fine adult goosander, of which species immature birds had occurred earlier in the year, was killed on Breydon, on the 11th March.

Black Guillemot. An adult male, in change from winter to summer plumage, was washed ashore on Caister beach, near Yarmouth, on the 22nd of March, during a prevalence of north-easterly gales, other birds—such as razorbills, common guillemots, &c.—being found dead in like manner about the same time. This species is decidedly rare on the Norfolk coast.

Lesser Spotted Woodpecker. A bird of this species was observed on the trunk of a tree at Keswick on the 20th of April, but was not seen again. It kept near the top of the tree, and its tapping could be heard at some distance. About the last week in March another was sent up to Norwich to be stuffed, from Tibbenham, in Suffolk.

Blacktailed Godwit. Three specimens, a male and two females, in full summer plumage, were shot on Breydon on the 27th of April. I have never seen this godwit so perfect in this stage of plumage since it ceased to breed in Norfolk, of which former residents examples may be seen in old Norfolk collections.

Shorteared Owl. A bird of this species, which formerly bred in this county, was received by a Norwich birdstuffer as late as the 3rd of May, but I could not ascertain in what locality it was killed.

Stilt Plover. An adult female of this rarity was shot at Ingham, near Stalham, on the 20th of May. The brown tint of the back, as compared with the dark green of the wings and the dusky feathers of the occiput, indicated the sex, and on dissection I found the ovary contained four eggs varying in size from a pea to a hemp-seed, and the rest not larger than small millet. The stomach was filled with minute fragments of Coleopterous water insects, with some largish pebbles and gritty matter. Three days after death the legs and feet were reddish orange—a sort of orange and vermilion blended. The following were the principal measurements:—

Length from tip of bill to end of tail - - - - -	14 inches.
Bill, along the upper mandible - - - - - -	$2\frac{3}{8}$,,
Wing, from carpal joint to end of first quill, the longest	$9\frac{1}{8}$,,
Tarsus - - - - - - - - - - -	$4\frac{6}{8}$,,
Tibia, bare portion - - - - - - - -	$3\frac{4}{8}$,,
Middle toe and nail - - - - - - - -	$1\frac{3}{8}$,,

Irides rich red, almost vermilion. The tongue is short for the length of the bill, and fits, as it were, into a groove, being just one inch and three-eighths short of the tip of the beak. Two months later a second stilt plover was killed at Ditchingham, near Bungay, towards the end of July. The bird was shot by a labouring man as it was feeding in a broad but shallow piece of water on Outney common, known as the "old river." It was quite alone and as from its plumage and measurements, so far as I could ascertain them after the bird was mounted it is no doubt a male, it may possibly be the mate of the female previously shot at Ingham. The sex was not ascertained by dissection.

Bill along the upper mandible - - - - - -	$2\frac{6}{8}$ inches.
Carpal joint to end of first quill, the longest - - - -	$9\frac{6}{8}$,,
Tarsus - - - - - - - - - - -	$5\frac{2}{8}$,,
Bare part of Tibia - - - - - - - - -	$3\frac{2}{8}$,,
Middle toe and Claw - - - - - - - - -	$1\frac{4}{8}$,,

Being badly stuffed in the first instance, the total length of this bird could not be ascertained with any certainty. In skins of this species collected in Egypt by Mr. J. H. Gurney, junr. three males exceed three females in the length of the tarsi by about one-third of an inch. I have also measured the tarsus of a young female from Mr. Gurney's collection, with the following result:—

Immature female (Egypt) - - - - - -	$4\frac{6}{8}$ inches.
Adult female (Ingham, Norfolk) - - - - -	$4\frac{6}{8}$ "
Supposed male (Ditchingham, Norfolk) - - - -	$5\frac{2}{8}$ "

This, with the colour of its plumage on the back and wings will, I think, decide the sex of the latter specimen.

The last example of this remarkable bird procured in Norfolk, was a female shot on Hickling Broad on the 7th May, 1842; but one, which escaped the Yarmouth gunners, was seen on the beach on the 19th of May, 1866.

Spotted Redshank. An adult male in full summer dress was killed at Yarmouth on the 14th of May, certainly the darkest plumaged bird of this species I have seen killed in Norfolk. A young male in its first year's plumage was shot at Stalham on the 16th of August.

Lesser Gray Shrike. This species, the *Lanius minor* of J. F. Gmelin, is included by Professor Newton in the 4th Ed. of Yarrell's 'Brit. Bds.;' from the occurrence of two specimens, one obtained in the Scilly Isles in Nov. 1851, in the collection of Mr. Hearle Rodd, of Penzance; the other at Great Yarmouth, in Norfolk, in the Spring of 1869; the particulars of which were recorded by Mr. Murray A. Matthew the present owner of the specimen, and by myself, in the 'Zoologist,' (S.S.p.p. 2060 and 2139.) From the enquiries I made at that time, I felt no hesitation in expressing my belief in the genuineness of Mr. Matthew's bird as having actually occurred in a wild state on the Norfolk coast; and in confirmation of the same I have now the satisfaction of recording the occurrence of a second specimen at Yarmouth which was taken alive in a greenhouse, in the very same locality as the last, the North End Gardens, in the last week in May, 1875. On the 2nd of June this bird (now in Mr. Gurney's collection), was brought to me in the flesh, having died in a cage in which it was confined, and it had apparently been dead a day or two. It proved, on dissection, to be a male, and the stomach being perfectly empty the bird had probably refused all food after its capture.

Hoopoe. In the first volume of the 'Birds of Norfolk,' I gave a list of all the specimens of this most conspicuous bird that had

come under my notice as killed in Norfolk, or on the immediately adjoining coast of Suffolk, from 1850 to 1865, inclusive, showing the extraordinary regularity of its appearance during the spring months and its occasional visits in autumn. As if to contradict my assertion, however, that it was much too common to warrant its constant persecution and slaughter on our inhospitable coast, I am not aware of a single specimen having been procured in Norfolk, since that time, until the spring of this year (1875) when, as recorded by Mr. T. E. Gunn in the 'Zoologist' (p. 4664), a female was shot at Horstead, near Norwich, on the 22nd of April. In 'Land and Water' for July 17th, is also a notice of one obtained this spring at Herringfleet, near Lowestoft, Suffolk. The cause of its rarity on our eastern coast during the last ten years I am at a loss to account for.

NESTING OF THE POCHARD AND SUPPOSED NESTING OF THE TUFTED DUCK IN NORFOLK. I have ascertained this summer, having myself found both eggs and young, that the pochard still breeds, in a wild state, on one or two of our Norfolk meres but nowhere in the "Broad" district. Having also, on the same waters, seen three pairs of tufted ducks still located there, of their own accord, in the first week in June, I see no reason why this species should not also breed with us, though I failed to discover a nest, but the agitation of one female was so demonstrative as to lead to a strong suspicion that it had a nest not far off, in the thick undergrowth of a small island.* I may here mention, also, that I have two notices of widgeon flushed, in different localities in the county, in the middle of June; and still more remarkable, if true, yet on authority I can scarcely doubt, that a brood of young common scoters was seen on Hickling Broad throughout the summer. Mr. Booth, who was in that neighbourhood in July, tells me that he saw some fourteen or fifteen scoters flying over that Broad towards the end of the month.

MONTAGU'S HARRIER BREEDING IN NORFOLK. An adult female and five young ones, which had apparently not long quitted the nest, were taken on the 30th July in a marsh at Upton, near Acle.

* On the same Mere, May 29th, 1876 (when these note were in type), a hen tufted duck was flushed from her nest, containing six eggs. Four males and two females were seen.

SHORELARK. Several of these birds, only a few years since considered rarities, in this, as in other counties in England, were observed on our coast this autumn, in the vicinity of Yarmouth, consorting, as they frequently do, with snow buntings. Four specimens were shot in that locality about the middle of October, and two on the 6th of November when others were seen at the same time.

GREAT SNIPE. A rather unusual number of the "double" or solitary snipe, as this species is also called, were met with in various parts of the county early in September, and a single bird was shot at Ranworth on the 20th of August.

FULMAR PETREL. A specimen of this fine petrel was shot at Burnham Overy about the middle of August.

GLAUCUS GULL. This fine species, in immature plumage, has been procured in several instances on this and other parts of the east coast during the winter months.

MIGRATORY WADERS. Amongst the rarer birds of this kind obtained on our coast, during their autumnal passage, may be noted a pygmy curlew shot at Cley, on the 31st of August; a small flock of ruffs seen and one shot, at Blakeney, on the 15th of September; a little stint and a purple sandpiper killed at the same place on the 28th; and another purple sandpiper shot at Yarmouth about the 12th of November. A small flock of golden plover was observed at Northrepps as early as the end of August.

RAVEN. One of these fine birds was observed, on the wing, at Sheringham, in October, but it has, I believe, ceased to breed anywhere in Norfolk.

RED-NECKED AND GRAY PHALAROPES. I last year recorded the occurrence, during the summer and autumn, of four specimens of the red-necked phalarope, which has become of late years very scarce on the Norfolk coast. I have now to add another example, shot on a duck pond at Hingham, on the 13th of November, a female in change of plumage. A grey phalarope, a female, in the

perfect winter plumage, from which its name is derived, was shot on the 24th of November at Beeston, near Cromer, but a male, shot on Breydon on the 15th of December, still retained traces of its summer plumage on the throat, neck, and wings.

NORFOLK HERONRIES. The pair of herons which I noticed last year as having nested and reared their young in the Keswick rookery, near Norwich, a former haunt of this species, returned to the same spot this spring, but, from the persecution of the rooks, failed to establish themselves a second time. At Sheringham, near Cromer, a single pair, as Mr. H. M. Upcher informs me, have reared their young, both this year and last, stragglers, possibly, from the flourishing colony in Gunton Park.

ROOKS MIGRATORY. A large increase of rooks, (apparently migratory) accompanied by great numbers of jackdaws, was remarked both at Northrepps and Sheringham on the 7th of November. Mr. Gurney has remarked for some years the annual arrival of rooks on our coast from across the German Ocean, in the months of October and November, but this year the number of these migrants was considerably larger than usual.*

MAGPIES. On the 24th of December seven magpies were seen together on a hedge at Weyborne, and on the 30th six were observed in the same spot. So scarce has this species become of late years, in this game preserving county, that there is little doubt these were recent arrivals on that part of the coast, and it is not the first time I have heard of as many being seen at one time at Weyborne. A pair of these birds were shot on the 4th of May at Tylney All Saints, on the opposite side of the county, which possibly might have remained to breed.

* In the 'Zoologist' for March, 1876 (p. 4837), Mr. Cordeaux quotes as follows from a letter, dated Christmas Day, 1875, from Mr. Gätke, of Heligoland. "An abundance of rooks there has been, as nobody ever witnessed before on this island; these last ten years together have certainly not seen here so many of these birds as this one autumn alone." See also a note in the 'Field,' Feb. 12th, 1876, from Mr. R. Collett, of Christiania, on the periodical migration of rooks to and from the south coast of Norway.

LATE APPEARANCE OF THE NIGHTJAR AND HOUSE MARTIN. A nightjar was shot at Hickling on the 6th of November, an unusually late date for that species, and a single house martin was seen at Keswick on the 20th, and two at Thorpe, near Norwich, on the 23rd.

SANDWICH TERN. An immature specimen was shot at Yarmouth on the 20th of October.

LITTLE GULL. Several of these small gulls seem to have been observed, and specimens obtained, along the east coast this autumn, from the Humber, southwards. Four were shot from the beach at Yarmouth between the 18th and 30th of October.

RED-NECKED AND SCLAVONIAN GREBES. Mr. T. E. Gunn records in the 'Zoologist' (p. 4790), four red-necked grebes sent him to be stuffed, one in October and three in December, three from the neighbourhood of Yarmouth, and one from Sheringham. An adult female killed on Breydon, on the 30th of October, was in nearly full summer dress. An immature Sclavonian grebe was obtained as far inland as the river side at Earlham bridge, near Norwich.

THE EASTERN GOLDEN PLOVER *(Charadrius fulvus)* IN NORFOLK. To Mr. Edward Bidwell and Mr. H. E. Dresser we are indebted for the identification of a single specimen of this rare European plover which was sent up to Leadenhall Market from Norfolk, with a lot of golden plover in December, 1874, and is a species new, not only to this county but to Great Britain. By a letter from Mr. Dresser in the 'Ibis,' (1875, p. 513) we learn that his attention was first directed to the bird by Mr. Bidwell, who informed him that he had seen an odd variety of the golden plover in Leadenhall Market. He at once went to examine it, and as before stated, amongst a number of golden plover, recently sent up from Norfolk, he recognised this rarity which "closely resembles examples of *C. fulvus* from Asia, and has most of the feathers on the upper parts margined with yellow." Mr. Dresser further describes this specimen "as badly damaged and, having been kept in the shop during mild weather for ten days, it had already become tainted," but he succeeded in making a passable skin of it.

BITTERNS. I have heard of five or six specimens killed in the neighbourhood of Yarmouth this winter, and one, received from the same locality by Mr. T. E. Gunn, in December, had the remains of a dozen water newts in its stomach.

PURPLE HERON. A young female in its first year's plumage was shot in a marsh near Hingham, on or about the 25th of September, and is now in Lord Kimberley's collection.

SEA EAGLES AND OTHER RAPTORIAL MIGRANTS. Although one or two immature sea eagles *(Haliæetus albicilla)* are observed almost every year on some part of our coast, in the autumn and winter, the occurrence of not less than seven of these noble birds during the last three months of 1875 is worthy of record.

One appeared at Northrepps as early as the 27th of October, and two at Herringfleet, near Yarmouth, on the 1st of November,* which, being much persecuted by rooks, ascended to a great height, and left that neighbourhood. On the 12th of November one was seen at Sheringham, and on the 18th one was shot at Holkham, and another at Burgh St. Peter on the 27th; and on the 31st of December, just a month later, a fine eagle was seen passing, at no great height, over the garden at Northrepps Hall, which caused much commotion amongst the domestic fowls. Of the OSPREY, or fishing eagle, a single bird, which had been remarked a day or two before at Burston, near Diss, was killed on the 25th of October, at Redgrave Hall, in Suffolk. ROUGHLEGGED BUZZARDS also appeared, during the autumn months, in unusual numbers, inland and near the sea, both in Norfolk and Suffolk. I have heard of seven or eight specimens killed between the 20th of October and the 23rd of December at Yarmouth, Palling, Haverland, Hemblington and Burlingham, all in immature plumage, whilst others were seen elsewhere, more particularly in the neighbourhood of Cromer, during the same period. A COMMON BUZZARD was trapped at Rackheath

* These were recorded at the time in 'Land and Water' as golden eagles, but were no doubt of the more common species, as was a fine young bird shot on Fritton lake, in January, 1876, also described in the same journal as a golden eagle.

on the 26th of October. Of PEREGRINE FALCONS, three immature and one adult were shot, or trapped, at Yarmouth, Thompson, near Watton, and Taverham and Rackheath, near Norwich; and HARRIERS either HEN HARRIERS or MONTAGU'S appeared rather numerously in October and November on the coast, near Cromer. A young male of the latter species was shot at Burgh St. Peter, in December, and a marsh harrier, with yellow head and shoulders, at Yarmouth on the 12th of October. With these should also be mentioned two adult male MERLINS (a species rarely met with in mature plumage, except in severe weather), one shot at Beeston, near Cromer, on the 23rd of October, and one at Taverham on the 13th of November; and three or four immature specimens were observed in the neighbourhood of Cromer about the same time.

BLACK REDSTART.—A female of this rather rare species in Norfolk was shot at Cley on the [illegible]th of December.

GREAT GRAY SHRIKE.—Like the true raptores this winter visitant seems to have occurred in rather more instances than usual. Of three specimens that have come to my knowledge, as killed during October and November, one was shot at Hunstanton, one at Yarmouth, and one at Thorpe near Norwich.

WINTER MIGRANTS DURING THE FLOODS AND SNOWSTORMS.—The heavy and continuous rains in the early part of November which, in the "Broad" and "Fen" districts, caused floods only equalled, in the extent of lands submerged, by those in the Winter of 1852–3, drove many of the snipe, plover, and other marsh birds unto the uplands, whilst the greater part, no doubt, quitted the county altogether, to return only with the spring flight. In the "Fens," about Brandon and Lakenheath, thousands of acres were laid under water, and though fowl in large numbers frequented the shallow waters, the gunners, I am told, could do little with them being so difficult of approach. At Surlingham, over a hundred duck and mallard were seen in one lump, but the Norwich Market, at least, showed no sign of their abundance. LAPWINGS in considerable flocks frequented the flooded marshes close to this City, and numerous GULLS as well, came inland to

feed on the drowned worms. WOODCOCKS appear to have been plentiful in the beginning of November, when fifteen couple were shot at Sheringham, on the 5th, and many were met with, immediately on the coast, in the neighbourhood of Yarmouth. The occurrence of many of the larger raptores in October and November, to whatever cause attributable, has been already referred to. Two BEWICK'S SWANS, one adult and one immature, were shot at Yarmouth as early as the month of October, and a LONG-TAILED DUCK, at Hunstanton, on the 27th of the same month; a single storm driven specimen of the LITTLE AUK was also picked up dead, as far inland as Kimberley, on the 30th of November. At Thompson Mere, near Watton, a GREAT NORTHERN DIVER was shot on the 7th of November, where also, I understand, a very considerable flock of wild geese, most probably of the PINK-FOOTED species, frequented during the middle of the month, passing regularly from that locality, early in the morning, to the Wretham Meres and the surrounding heath. Thus far the winter had been mild and open but in the first week in December we had a deep fall of snow, from twelve to fourteen inches on the level; the frosts, however, were at no time severe, and neither resident nor migratory birds seemed to suffer, in strange contrast to the previous winter. Apparently warned, atmospherically, of the coming change our winter visitants passed on to the southwards, in advance of the snowstorm, as no starving redwings and fieldfares besieged our city gardens for berries as in 1874, and the dearth of all kinds of marketable fowl, not only in our own but in the London markets, was remarkable; and gunners have again realised my former assertion, that coarse weather setting in before Christmas leaves little sport, by land or water, for the new year. I heard of an order sent from Lincolnshire to Leadenhall market for a few golden plovers early in January which could not be supplied, and lapwings took their place at 1s. 9d. a piece.

Fortunately for the French partridges, as the snow laid for several days, a slight frost on the surface enabled them to run without sinking, and thus numbers were spared that would otherwise have been shot from the fences. From Yarmouth, I learn that a good many fowl were taken, during the first frost, in Fritton Decoy, and GOOSANDERS and MERGANSERS, SCAUPS AND GOLDEN EYES appeared on the coast, but nearly all immature birds. On

the 4th of December twenty-four GRAY WILD GEESE were seen, flying low, at Northrepps, and forty-three WILD SWANS off Weyborne on the same day. Four BEWICK SWANS were shot on Breydon on the 12th and a BEAN GOOSE at Runton, one of a flock of five, on the 18th. These with two fine male SHELDRAKES from Yarmouth and Westwick, an immature SCLAVONIAN GREBE on the river near Earlham Bridge, and three BLACK-THROATED DIVERS, one immature and two nearly adult from Yarmouth, Blakeney and Salthouse seem to have been the only birds worth mentioning, during the month, in the hands of our bird-stuffers.

VI.

NOTES ON THE METEOROLOGICAL OBSERVATIONS

RECORDED AT NORWICH DURING THE YEAR 1875.

BY JOHN QUINTON, JUN., ASSISTANT-SECRETARY.

Registrar to the Norwich Meteorological Society.

THE remarkably cold weather which prevailed during December, 1874, terminated on the 2nd of January, and was succeeded by quite as an unusual a period of mild weather throughout January. The mean temperature of the month was 40.9, and the winds mostly light from the S. and S.W. Mr. Glaisher states that it was the mildest January since 1846, and that only three times during the last hundred years had so high a mean temperature been recorded at Greenwich in January. The barometric pressure averaged at about the normal value; the only remarkable fluctuation was a fall from 29.942 at 9 p.m. the 22nd, to 29.054 at 3 p.m. the 24th; at 9 a.m. the 25th it had risen to 29.143, and this was succeeded by a rapid rise to 30.127 at 9 a.m. the 26th, a rise of .984 in. in 24 hours; this was attended by a strong S.S.W. and W.S.W. gale, the daily velocity of the wind on the 24th and 25th was 370 and 382 miles. The rainfall for January exceeded the average by half-an-inch. On

the 30th of January the thermometer again fell below the freezing point, and was succeeded by dry, cold, gloomy weather throughout February; the temperature was 6.6 degrees below that of January, and the rainfall, including several showers of snow and sleet, was 0.08 in. deficient; the winds were mostly from the E., N.E., and N.W. The barometric pressure averaged very high until the 22nd, then the readings fell from 30.140 at 9 p.m., to 29.382 at 3 p.m. the 24th. The mean temperature of February was so unusually low that Mr. Glaisher states, that only fourteen times during the last hundred years has it been below 35 degrees. With the exception of the 7th, 8th, and 9th of March, which were mild days with S. and S.W. winds, the cold weather continued until March the 23rd, with E., N.E., and N.W. winds; the remaining days, except the 28th, were much milder. A strong S.W. and W. gale was recorded from 4 a.m. to 4 p.m. on the 9th, the velocity in the twelve hours was 250 miles. The mean temperature for the month was the lowest since 1870; frosts occurred on sixteen nights. Barometric pressure averaged high, no unusually sudden oscillation was recorded. Rain fell on only eight days, and was the smallest amount recorded in March since 1856; the total fall was 1.09 deficient. April commenced with a very rapid fall in the barometric pressure from 30.538 on the 1st, to 29.258 on the 5th; this was followed by a rise to 30.179 on the 10th, after which the pressure remained high, and slight variations were recorded, the winds being chiefly from the N.E. and E. and without any rain. The days during April were mostly overcast and cloudy, except from the 16th to the 20th which were fine, bright days; the rainfall, which fell on only five days, between the 4th and 9th, was 0.85 in. deficient. The temperature averaged at about the normal value, but considerable variation was recorded in the *day* temperatures, which averaged 56.0 on the first seven days, fell to 41.0 on the 9th, increased to 66.0 and 65.5 on the 20th and 21st, followed by three cold days of 49.8, 47.5, and 48.5. The temperature rose 11 degrees on the 25th, and was succeeded by fine, mild weather, which lasted throughout May. The unusually high temperature of 80.8 was recorded on the 15th of May; and during the month on only eight days was the maximum temperature below 60 degrees, and on only two nights the minimum below 40 degrees. The rainfall was again deficient, causing the fall for the spring months (March to

May), to be 2.5 in. below the average of the 30 years 1841—70. The fine mild weather continued until the 10th of June, the unusually high temperature of 85.0 was recorded on the 4th. From the 10th to the 21st of June the sky was generally overcast, frequent slight showers of rain, and the temperature below the average, the maximum on the 21st was only 59.0; from the 22nd to the 30th it was rather milder, but the sky was still generally overcast. The barometric pressure averaged at about the average during May and slightly below the average during June, but no remarkable oscillation was recorded. July was remarkable for the excessive rainfall and low temperatures. The rainfall was 2.94 in. in excess of the average, being the heaviest fall recorded in July since 1850. The mean temperature was about 5 degrees below the average; this deficiency occurred chiefly in the day temperatures, which were about 7.5 degrees below, whereas the night temperatures were only about 1 degree below the average. The barometric pressure averaged high during the first week, with N. and N.E. winds; it fell rapidly from 30.315 on the 7th to the minimum for the month, 29.323 at 9 p.m. the 9th, followed by strong W. and S.W. winds on the 10th and 11th. From the 12th to the 17th the winds were chiefly from the E., and the days very cold, sky overcast, and frequent showers of rain, with thunderstorms on the 17th and 18th. From the 18th until the 24th the barometer oscillated slightly at 29.7 and 29.8; the winds were mostly from the W. and S.W., and the unusual amount of 3.34 in. of rain was recorded during the week, 1.32 in. fell on the 21st, 0.75 of which fell in one hour, from 11 a.m. to noon. The last week was much finer, with light E. and N.W. winds. The first week in August was fine and dry, but very cold, with N. and N.E. winds; the maximum temperature on the 1st was only 62.8, followed by a night temperature of 47.5. A strong N.N.W. gale with a daily velocity of 323 miles was recorded on the 5th. On the 8th a period of much milder weather commenced and lasted until the 28th, with light S.W. and W. winds; but from the 8th to the 13th the sky was generally overcast, and slight showers of rain were recorded; an unusually heavy fall of 0.51 in. in one hour, fell on the 13th between 9.30 and 10.30 a.m. After the 13th no rain fell until the 29th, and the days were mostly fine and bright. The last three days of the month were considerably colder, and a W.S.W. gale of 324 miles was recorded on the

31st. The rainfall was 1.20 in. below the monthly average. During the first three weeks of September the weather was very mild, the mean temperature exceeded the average by about 7 degrees; there was, however, considerable variation in the day temperatures; the first eight days were very mild, with S. and S.W. winds; the thermometer reaching 80 degrees on the 8th; on the 10th the wind backed to N.E., and the highest temperature was only 59.8; N.E. and E. winds prevailed until the 19th, when it veered to S.E., and the thermometer rose to 77.8. The remaining days were much colder, with frequent showers of rain, the highest temperature on the 24th being only 58.5, and on the 30th 58.0. Very little variation was recorded in the night temperatures, which were unusually high, exceeding the average by about 5 degrees; only twice, on the 27th and 29th, did the thermometer fall below 48 degrees. The sky during the days was mostly overcast and cloudy, but the nights were generally fine. The barometric pressure averaged high, with little variation, until the 21st, but from then until the end of the month considerable oscillation was recorded. The only high wind during September was a S.W. gale, from midnight on the 26th to noon on the 27th, when the velocity of the wind was 189 miles in the twelve hours. The rainfall was 0.17 in. in excess of the average; 1.83 in. fell between the 19th and 30th. Mr. Glaisher reports that only eight times during the last hundred years had so high a mean temperature been recorded at Greenwich in September, as this year. October was divided into two warm and two cold periods; from the 1st to the 9th the weather was mild and wet, with a mean temperature of 54.3, and rainfall of 1.27 in., with S. and S.W. winds. From the 10th to the 20th the mean was only 46.6; rain fell every day, but generally in slight showers; the winds were light and variable, except on the 19th and 20th, when a strong E. gale prevailed, with a daily velocity of 350 and 358 miles. The thermometer rose to 60 degrees on the 21st, and three warm days with S.E. wind, and a mean temperature of 53.1 was recorded. The remaining eight days were very overcast and cold, the winds chiefly from the E., and the temperature only averaged 44.5; a thunderstorm occurred at 10 p.m. on the 22nd. Rain fell on 21 days in October, but the showers were mostly small and the total only exceeded the average by 0.49 in. Considerable oscillation was recorded in the barometer during the month, the most remarkable

feature was a fall from 29.857 on the 10th, to 29.218 on the 11th, after which the pressure remained unusually low until the 14th, when the minimum, 29.177, was recorded, followed by a gradual rise to 29.913 on the 17th. November was unusually remarkable for the great and sudden barometric variations, heavy gales, and excessive rainfall. The first sudden fall in the barometer was from 29.828 at 9 a.m. the 5th, to 28.950 at 9 a.m. the 6th, attended by a fall of 6-10ths of rain, and followed by a strong W. and W.S.W. gale from 11 a.m. the 6th, to 2 p.m. the 7th. At 9 p.m. the 9th the barometer registered 29.221, but fell to 28.637 (the minimum for the year) at 9 a.m. the 10th; on the 10th the wind *veered* from N.E. to N.W., but between 9 p.m., and 2 a.m. the 11th, *backed* the whole compass, followed by 6-10ths of rain in next three hours. This was succeeded by a quick rise in the barometric pressure, which registered 29.974 at 9 p.m. the 12th; another rapid fall was recorded on the 13th, attended by 8-10ths of rain, and at 9 a.m. the 14th, it only registered 29.006. The very unusual increase of 1.137 in. in the pressure was recorded in next 24 hours; the wind veered to N.W. at 4.30 p.m. the 14th, and blew strong until 10 p.m. The only other variation of account was a fall from 30.016 on the 18th, to 29.432 at 3 p.m. the 19th, attended by a strong S.W. and W.S.W. wind; at 4 p.m. the 19th, the wind veered to N.W. and blew with unusual force until midnight, the velocity of the wind in the eight hours was 247 miles, and the greatest 37 miles, between 8 and 9 o'clock. The wind continued strong from the N.W. throughout the 20th, when the daily velocity was 469 miles. The remaining days were cold, with frequent showers of drizzling rain and sleet, strong E. and E.N.E. winds, and the barometer high with little variation. The mean temperature of November was at about the usual value, but the mean for the first 19 days was 45.2, whereas the last 11 days only averaged 36.7. The rainfall was the largest amount recorded in November during the last thirty-five years, and exceed the average by 3.03 in. The cold weather which set in on November the 20th, lasted until December the 11th; a heavy fall of snow occurred on the night of the 1st of December, and frequent slight falls on subsequent days; it measured in depth from 12 to 14 inches. The temperature for the first 10 days only averaged 32.4; frosts occurred every night, and the highest day temperature was only 38.5; N.E. and N.W. winds

prevailed. From the 11th to the 31st the weather was much milder, the temperature averaged 41.6, and only one night of frost was recorded; the winds were from the W., S.W., and S.; the sky was generally overcast, except from the 22nd to the 25th, which were fine, bright, but squally days. The velocity of the wind from the S.W. on the 21st, 22nd, 23rd, and 24th, was 274, 368, 285, and 330, miles respectively. Barometric pressure averaged high and no remarkable oscillation was recorded. The rainfall was 0.27 in. deficient, the total fall only amounted to 1.70 in., 1.34 in. of which was melted snow. Rain fell on 159 days during the year, and the total fall, 26.55 in., exceeded the average of the thirty years 1841—70 by 2.96 inches.

NOTE.—No Barometrical nor Thermometrical observations were taken from the 14th to the 21st inclusive, of August.

VII.

MISCELLANEOUS NOTES AND OBSERVATIONS.

MAMMALIA.

BALÆNOPTERA MUSCULUS (Lin.) AT LYNN.—A whale of this species was found floating dead in the Channel near the knock buoy in the Lynn Roads, on Tuesday the 9th of August, 1875. The men brought it on shore at the back of the stone banks, about two miles below Lynn. When found it was in an advanced state of decomposition and must have been long dead. It measured 42 feet in length. The carcase was purchased by a manure company, and I believe cut up before any competent authority had examined it, but some of the remains were afterwards examined by Mr. Clarke, of Cambridge, who pronounced it a young specimen of *B. musculus*, and secured a section of the skull for the Cambridge Museum.

Whence come these dead, and more or less decomposed Fin-whales that are from time to time stranded on our shores? Perhaps

LOGICAL REGISTER.

	Daily Range.	Mean Temperature.	Rain.	No. of days on which it fell.	WIND. Direction. N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Mean daily Velocity.
WINTER.	°	°	In.										Miles.
December, 1874	9.2	31.9	2.15	20	4	1	1	1	2	4	14	4	169
January, 1875	0.1	40.9	2.26	19	0	1	0	5	11	8	6	0	193
February, 1875	7.9	34.3	1.26	12	1	3	12	1	1	2	2	6	169
Dec. 1874 to Feb. 1875	9.1	35.7	5.67	51	5	5	13	7	14	14	22	10	177
Five preceding Winters	9.7	37.9	5.71	37	7	5	10	9	21	17	14	7	186
SPRING.													
March, 1875	11.2	39.2	.44	8	3	6	7	1	2	3	2	7	216
April, 1875	18.7	45.1	.64	5	7	5	3	2	2	3	6	2	159
May, 1875	19.7	53.7	1.39	11	3	1	2	3	5	7	5	5	171
March to May, 1875	16.5	46.0	2.47	24	13	12	12	6	9	13	13	14	182
Five preceding Springs	16.5	45.8	4.29	34	14	7	13	7	9	12	15	15	189
SUMMER.													
June, 1875	21.8	58.8	1.65	14	2	2	2	5	8	5	2	4	178
July, 1875	13.8	58.3	5.34	14	3	4	8	2	2	3	7	2	174
August, 1875	16.1	61.9	1.04	9	4	4	2	0	4	8	6	3	158
June to August, 1875	17.2	59.7	8.03	37	9	10	12	7	14	16	15	9	170
Five prcdng. Summers	18.6	59.9	5.93	33	11	7	10	7	13	14	20	10	168
AUTUMN.													
September, 1875	14.0	59.6	2.25	13	2	4	6	3	4	6	3	2	169
October, 1875	10.6	48.5	3.30	21	3	1	10	4	4	6	3	0	177
November, 1875	8.2	41.7	5.28	21	3	5	4	3	5	3	5	2	208
Sept. to Nov., 1875	10.9	49.9	10.83	55	8	10	20	10	13	15	11	4	185
Five prcdng. Autumns	13.4	48.6	7.14	40	5	6	8	8	20	19	16	9	168

UNIV. OF MICH.

the following may throw some light upon the subject. On board a Vadsö and Hamburgh Steamer, last summer, the Captain told me that a certain Herr Foin established 8 or 9 years ago at Vadsö, a fishery for this species, at first his success was very small as it is difficult and dangerous in the extreme to take this Whale in the ordinary way, from its active habits and the great velocity with which it rushes through the water when struck by the harpoon; of late years, however, he has perfected his mode of attack, and kills 30 or 40 each season—he found the ordinary harpoon of little use, for the reasons above stated, and now makes use of a detonating shell, and seldom loses a fish. They are taken within a few miles of Vadsö, and towed into that port, where they are drawn up a slip by a winch and then stripped of their blubber; the carcase is made into manure and the blubber refined on the spot. In the summer of 1874, they killed 35 whales, and this summer when my informant left Vadsö, about the middle of July, they had already killed 32, and expected to take several more before the season finished. The Captain added that it was not a very paying business, but that Mr. Foin was a very charitable gentleman and wished to find employment for the people. I think it highly probable that the majority of the Fin-whales which have been stranded of late years on the British Coast, may have been wounded in this fishery, and after death borne south by wind and currents to our shores.—T. Southwell.

Note.—Since the above was written I have seen an account of Mr. Foin's fishery in Lamont's '*Yachting in the Arctic Seas.*' Mr. Lamont gives no description of what he calls the "shell-harpoon," but says it weighs twenty pounds and contains nearly a pound of powder. In Scammon's '*Marine Mammals of the North-Western Coast of North America,*' at p. 228 (foot-note), will be found a description of an apparatus known as "Pierce's Bomb-lance," used in the American Whale-fishery, which appears to be a highly ingenious and effective instrument, speedy in its action and therefore much less cruel than the old harpoon and lance.—T.S.

Martens, &c., in Suffolk in 1811. I have a cutting from a newspaper of the year 1811, by which it appears that at the

"Suffolk Gamekeepers' Annual Meeting" held at Bury on the 9th December of that year, a prize was given to one Sharnton as the most successful gamekeeper.

He had the looking over (with two under-keepers) of 4000 acres, but in what parishes the manor lay is not stated; evidently, however, it was in Suffolk.

Sharnton gave in an account of vermin destroyed by him and his assistants in twelve months, which I think may be worthy of a place in the records of our Naturalists' Society, as bearing on the existence of the marten in Suffolk, 65 years ago,—his record is as follows:—

Foxes	22
Martens (spelled Martins)	43
Polecats	31
Stoats	416
Crows and Magpies	120
Hawks of all kinds	167
Field Rats	310
Brown Owls	13
Wild Cats	7

J. H. GURNEY.

BIRDS.

HAWKING EXTRACT FROM AN OLD NEWSPAPER.

"*Swaffham, February 5th*, 1783.

"HAWKING.

"EARL OF ORFORD MANAGER OF THIS YEAR.

"The gentlemen of the Falconers' Society are hereby acquainted, that the hawks will be in England in the first week in March, and will begin kite and crow hawking immediately on the arrival. The quarters are fixed at Bourn Bridge, Cambridgeshire, forty-eight miles from London, until the first April meeting, when they will go to Barton Mills and Brandon till the 31st of May, when the season will finish.

"The hawks to be out every Saturday, Monday, and Wednesday, in each week at ten o'clock, provided the weather is favourable.

"Subscribers are desired to pay in their subscriptions, for this season, on or before the 20th of March, to Messrs. Coutts and Co., Bankers, in the Strand, London.

"N.B.—The cage consists of thirty-two flight falcons, [pere-

grines,] thirteen German hawks, [goshawks,] and seven Iceland falcons."—J. H. GURNEY.

RECORD OF THE ROSE-COLOURED PASTOR IN NORFOLK IN 1747.—Perhaps it may be worth notice that there is a record of the occurrence of the rose-coloured pastor in Norfolk as far back as 1747 in *Edwards' Natural History* (vol. iv, p. 222, supplementary matter). It was shot at Rougham by Mr. Roger North, as it was feeding among blackbirds.

Edwards records another killed at Norwood, from which he did not, as erroneously stated by Yarrell, take his picture. Which of them has the honour of being the first British specimen cannot now be ascertained.—J. H. GURNEY, JUN.

ON SOME NORFOLK BIRDS IN THE LATE MR. HENRY DOUBLEDAY'S COLLECTION.—At the sale of the late Mr. Doubleday's collection on the 23rd of August, 1871, I purchased a few Yarmouth rarities, which I am desirous of seeing recorded, viz.: a Night heron, two Baillon's crakes, and a little crake. Mr. Borrer, of Cowfold near Horsham, at the same time purchased a red-crested pochard, a male in change, marked in the catalogue "Yarmouth, very rare." I have the following note in Mr. Doubleday's handwriting about it:—"This I also had in the flesh from Mr. Stevens, [of Leadenhall Market,] who assured me that it came from Yarmouth, and I have no doubt of the correctness of this statement, as I saw the package in which it came with other sea birds."

There were also a pair of nyroca ducks from Yarmouth, but I have no note of who is now the owner of them.

This fine collection fetched £275. There was a large attendance of naturalists to see it dispersed at the Cock Hotel, Epping.—J. H. GURNEY, JUN.

THE FIRST BRITISH-KILLED RED-CRESTED WHISTLING DUCK.—It is now generally known that the credit of first introducing the red-crested whistling duck into the catalogue of English Birds is not due to Mr. Yarrell, but to a naturalist of Norfolk, the late Mr. Hunt, who gives in his *British Birds* (vol. ii, p. 333), two instances, the first being a drake in "Bullock's London Museum," which had been killed in Norfolk a few years previously.

When this fine collection was broken up in 1819, as I find

from a copy of the sale catalogue (in Prof. Newton's possession), it was bought by Lord Temple for £3 3s. What has now become of it I cannot say, but it is entered in the catalogue as "killed in Norfolk," (fifth day, lot 96,) and being the first British specimen, I think these particulars, as an assistance in authenticating it, may be interesting.—J. H. GURNEY, JUN.

THE GREY-CAPPED WAGTAIL (*Motacilla cinereicapilla.* Savi.) A NORFOLK BIRD.—I have the pleasure to announce a new variety of wagtail in Norfolk,—for by many it is not considered a species, —the grey-capped wagtail *(Motacilla cinereicapilla.* Savi.*)*.

A specimen was shot at or near Sherringham in the spring of 1842, and was recorded by Messrs. Gurney and Fisher as a blue-headed wagtail *(M. flava)*. It remained in my father's possession, as appears from a note made by him prior to 1854, and no doubt was expressed about it. I recently noticed its very dark ear-covets, dark crown, and narrow white streak above the ear only, as compared with the larger streak and far lighter head of British-killed examples of the true *M. flava*, and I then identified it as an undoubted specimen of *M. cinereicapilla*, which has so lately been figured for the first time in the capacity of a British bird by Mr. Gould. At this distance of time my father cannot remember from whom he bought it. There is a point on which some explanation is necessary. Messrs. Lubbock and Stevenson in their respective works state, that the Sherringham wagtail of 1842—the bird now under discussion—is in the Norwich Museum. But this is an error, though it is impossible now to see what lead Mr. Lubbock into the mistake. There is indeed a specimen of the *M. flava* in the Museum (No. 92), which may or may not be Norfolk-killed.—J. H. GURNEY, JUN.

INSECTS.

BEES COLLECTING POLLEN FROM FLOWERS OF ONE SPECIES ONLY. —It has been frequently stated by various authors, that bees in their peregrinations after pollen, collect it from the flowers of one species only during each journey, thus by a wise dispensation of divine Providence preventing in a great degree, hybridization of plants. I am sorry to say this interesting statement is not founded on facts. One day this month I caught a small Bumble Bee, and an *Andrena nigro-œnea*, the legs of both of which were loaded

with pollen, but of different colours, some was red and some was pale yellow. I took them home and washed some of the pollen off the leg of the Andrena on to a glass slide with chloroform, and a quarter inch objective revealed the fact that instead of one species of pollen grain there were many; not being acquainted with the microscopical appearance of the grains, I cannot say how many, but I could readily distinguish several decidedly different forms, clearly proving that these insects do not confine their visit to one species, but that all is fish that comes to their net; there is no doubt however that some species of bees are rarely to be found except at one particular species of plant.—J. B. Bridgman.

Singular Monstrosity of Nomada succincta.—The second dorsal plate of this unfortunate bee, seems to have been divided, and the right side to have united with the left half of the third segment; but the two halves of the second segment appear to be united at the base, and the apical margin of the joined segments is perfect and continuous, the right hand half of the third segment is separate and distinct, as if it had been broken down the centre, the result is, that instead of a transverse band of yellow across each of the two segments (second and third) there is a band crossing from the right of the second segment across to the left of her third segment, whilst there is an angular pointed spot on the left half of the second and the right of the third segment: this accident I should think must have taken place early in the pupal stage, as chitine when once fully formed is incapable of repair or reproduction.—John B. Bridgman.

Botany.

Clathrocystis æruginosa (*Henfrey*).—The first occurrence of this alga was noticed by Mr. Henfrey in a paper published in the *Trans. of the Mic. Soc., New Series*, vol. iv. p. 53, pl. 4, figs. 28—36. He says, "This remarkable form does not appear to have been hitherto found in Britain—we found it in the autumn of 1855 forming a scum extending over a large portion of the lake in the Royal Botanic Gardens at Kew."

Mr. Currey subsequently figured a form which he says differs from those of Henfrey in the greater number of the reticulations. (*Mic. Journ.* vol. vi.)

This difference would seem from the observations I have made

to consist in the greater age of the plant, which varies greatly in structure at different seasons, the reticulations becoming more complex as the autumn advances.

I have not been able to find any other published account of the occurrence of Clathrocystis than those mentioned above.

In June 1870, I discovered a large amount of it in the lake at Sandringham.

The surface of the water was covered with the green scum mentioned by Henfrey and on examining more closely I found that the plant was dispersed uniformly throughout the body of water.

The characteristic verdigris-green formed by the dried plant was well marked on the stones above the water line.

In September of the same year, I find the following entry in my note book: "The frustules are surrounded by extremely fine moniliform filaments of *spirillum*."

On reading Henfrey's notice of the discovery of the plant at Kew, it occurred to me that possibly it might have been introduced thence at some time, or other, with aquatic plants; but on making enquiry of the then head gardener, Mr. Carmichael, he informed that no plants had ever been brought from Kew, and indeed at that time there were none growing in the lake.

In October of the present year (1875), when driving past a pond at Anmer Hall, two miles distant from Sandringham, my attention was attracted by the peculiar scum on the surface, which was at once recognized as Clathrocystis (a portion of which I have forwarded to the Society).

It seems very probable that it has been recently introduced here, most likely by the agency of wild-fowl for I have been in the habit of passing the pond frequently and at all times of the year for the last eighteen years and so striking an appearance would, I think scarcely have escaped my notice.

It will be interesting to know if other localities have been, or should hereafter be, discovered in this county.—JOHN LOWE, M.D.

AMBROSIA PERUVIANA.—A species of Ambrosia closely resembling if not identical with the above, was found this autumn (1875) by the Rev. E. W. Dowell in a clover field at Bolwick Hall, Marsham. *A. peruviana* has been recorded as an alien in Yorkshire and Kent, and is supposed to have been imported with clover seed from the Argentine Republic.—H. D. GELDART.

VIII.

FAUNA AND FLORA OF NORFOLK.

PART VI, SECTION II.

A LIST OF FLOWERING PLANTS KNOWN TO OCCUR IN NORFOLK.

MONOCOTYLEDONOUS PLANTS.

TYPHACEÆ.

TYPHA LATIFOLIA. Linn.	e.	nc.	sc.	w.
„ ANGUSTIFOLIA. Linn.	e.	nc.	sc.	w.
SPARGANIUM RAMOSUM. Huds.	e.	nc.	sc.	w.
„ SIMPLEX. Huds.	e.	nc.	sc.	w.
„ MINIMUM. Fries.	e.	nc.	—	—

ARACEÆ.

ACORUS CALAMUS. Linn.	e.	nc.	sc.	—
ARUM MACULATUM. Linn.	e.	nc.	sc.	w.

LEMNACEÆ.

LEMNA TRISULCA. Linn.	e.	nc.	sc.	w.
„ MINOR. Linn.	e.	nc.	sc.	w.
„ GIBBA. Linn.	e.	nc.	sc.	w.
„ POLYRHIZA. Linn.	e.	nc.	sc.	w.

NAIADACEÆ.

POTAMOGETON NATANS. Linn.	e.	nc.	sc.	w.
„ POLYGONIFOLIUS. Pour.	e.	nc.	sc.	w.
Recorded in all these districts by Rev. Kirby Trimmer.				
„ PLANTAGINEUS. Ducros.	e.	—	sc.	w.
Roydon Common and East Walton, Dr. Lowe.				
„ RUFESCENS. Schrad.	—	—	sc.	—
Scole, Herb. Sm., Billingford and Ashill, Rev. Kirby Trimmer.				

POTAMOGETON HETEROPHYLLUS. Screb. . . — — sc. w.
Houghton Park, Rev. Kirby Trimmer.
Old Buckenham, B. G.
,, LUCENS. Linn. . . . . e. nc. sc. w.
Mintlyn, Mr. Bray, Dr. Lowe.
,, PRÆLONGUS. Wulf. . . . . e. nc. — —
Recorded by Rev. Kirby Trimmer.
,, PERFOLIATUS. Linn. . . . . e. nc. — w.
,, CRISPUS. Linn. . . . . e. nc. sc. w.
,, DENSUS. Linn. . . . . e. nc. sc. w.
,, ZOSTERIFOLIUS. Schum. . . . . e. — — —
Recorded by Rev. Kirby Trimmer.
,, ACUTIFOLIUS. Link. . . . . e. nc. — —
Recorded by Rev. Kirby Trimmer.
See E. B., 3rd ed.
,, OBTUSIFOLIUS. M. and K. . . . . e. nc. sc. w.
,, PUSILLUS. Linn. . . . . e. nc. sc. w.
,, TRICHOIDES. Cham. . . . . e. — sc. w.
Recorded in "e." and "sc." by its discoverer, Rev. Kirby Trimmer.
Terrington, Dr. Lowe.
,, PECTINATUS. Linn. . . . . e. nc. sc. w.
b, scoparius = marinus, Huds. . e. nc. — w.
Recorded by Rev. Kirby Trimmer.
c, flabellatus . . . . . — — — w.
ZANNICHELLIA PALUSTRIS. Linn. . . . . e. nc. sc. w.
,, PEDICILLATA. Fries. . . . . — nc. sc. w.
W. Lynn, Dr. Lowe.
RUPPIA SPIRALIS. Hartm. . . . . — — — —
Is recorded by Mr. H. C. Watson in Topograph. Bot. for his "e."
,, ROSTELLATA. Koch. . . . . — — — —
Is recorded by Mr. H. C. Watson in Topograph. Bot. for his "w."
ZOSTERA MARINA. Linn. . . . . e. nc. — w.

ALISMACEÆ.

TRIGLOCHIN PALUSTRE. Linn. . . . . e. nc. sc. w.

TRIGLOCHIN MARITIMUM. Linn. . . . . e. nc. — w.
SAGITTARIA SAGITTIFOLIA. Linn. . . . e. nc. sc. w.
ALISMA PLANTAGO. Linn. . . . . e. nc. sc. w.
„ RANUNCULOIDES. Linn. . . . e. nc. sc. w.
BUTOMUS UMBELLATUS. Linn. . . . . e. nc. sc. w.

HYDROCHARIDACEÆ.

HYDROCHARIS MORSUS-RANÆ. Linn. . . . e. nc. sc. w.
STRATIOTES ALOIDES. Linn. . . . . e. — — w.
Saddlebow, Dr. Lowe.
ELODIA CANADENSIS. Mich. . . . . e. nc. sc. w.

ORCHIDACEÆ.

ACERAS ANTHROPOPHORA. Brown. . . . . — — sc. w.
Ashwelthorpe and Forncett, Herb. Sm.
Roydon Com., Dr. Lowe.
Marham, Mr. Bray.
ORCHIS PYRAMIDALIS. Linn. . . . . e. nc. sc. w.
West Newton, Dr. Lowe.
„ USTULATA. Linn. . . . . — — — w.
Shouldham, B. G.
„ MORIO. Linn. . . . . e. nc. sc. w.
„ MASCULA. Linn. . . . . e. nc. sc. w.
„ INCARNATA. Linn. . . . . — — sc. w.
Roydon, (Diss) H. D. G.
Babingley, Roydon, (Lynn) Dr. Lowe.
„ LATIFOLIA. Linn. . . . . e. nc. sc. w.
„ MACULATA. Linn. . . . . e. nc. sc. w.
GYMNADENIA CONOPSEA. Brown. . . . . e. nc. sc. w.
Marham, Rev. W. Blyth.
Sandringham, Rev. J. Moxon.
HABENARIA VIRIDIS. Brown. . . . . e. nc. sc. w.
„ BIFOLIA. Bab. . . . . e. nc. sc. w.
„ CHLORANTHA. Bab. . . . . e. nc. sc. w.
Hunstanton and Ryburgh, Rev. E. W. Dowell.

HERMINIUM MONORCHIS. Brown. . . . . e. — — w.
Recorded in "e." by Rev. G. Munford.
Marham, Herb. Sm.
OPHRYS APIFERA. Huds. . . . . e. nc. sc. w.
„ MUSCIFERA. Huds. . . . . e. — sc. w.
Stoke Holy Cross, S. P. Woodward.
Congham, Dr. Lowe.
SPIRANTHES AUTUMNALIS. Rich. . . . . e. nc. — w.
LISTERA OVATA. Brown. . . . . e. nc. sc. w.
NEOTTIA NIDUS-AVIS. Rich. . . . . e. nc. sc. —
EPIPACTIS LATIFOLIA. Auct. . . . . e. — — w.
Westwick, Rev. Kirby Trimmer, 1875.
„ PALUSTRIS. Crantz. . . . . e. nc. sc. w.
LIPARIS LOESELII. Rich. . . . . — nc. sc. —
St. Faith's, Herb. Sm.
Roydon, (Diss) H. D. G., 1874.
MALAXIS PALUDOSA. Sw. . . . . — nc. — —
Felthorpe, Herb. Sm.

IRIDACEÆ.

IRIS FŒTIDISSIMA. Linn. . . . . e. nc. — —
Thorpe, Herb. Sm.
Binham, B. G., Rev. K. Trimmer.
„ PSEUD-ACORUS. Linn. . . . . e. nc. sc. w.
CROCUS VERNUS. All. . . . . — — sc. —

AMARYLLIDACEÆ.

NARCISSUS PSEUDO-NARCISSUS. Linn. . . . . e. nc. sc. w.
GALANTHUS NIVALIS. Linn. . . . . e. nc. — w.

DIOSCOREACEÆ.

TAMUS COMMUNIS. Linn. . . . . e. nc. sc. w.

TRILLIACEÆ.

PARIS QUADRIFOLIA. Linn. . . . . e. nc. sc. —

LILIACEÆ.

POLÆGONATUM MULTIFLORUM. All. . . . . e. — sc. —

„ OFFICINALE. All. . . . . e. — — —

Near Yarmouth F. B. Rev. Kirby Trimmer.

CONVALLARIA MAJALIS. Linn. . . . . e. nc. sc. w.

ASPARAGUS OFFICINALIS. Linn. . . . . e. — — —

Burgh, near Beccles, B. G. Rev. Kirby Trimmer.

RUSCUS ACULEATUS. Linn. . . . . e. — sc. w.

FRITILLARIA MELEAGRIS. Linn. . . . . — nc. sc. —

Mendham B. G. "nc." Rev. G. Munford.

TULIPA SYLVESTRIS. Linn. . . . . e. nc. — —

Cromer, Rev. T. Clowes. Trowse, S. P. W. Carrow, Eng. Fl. Seething.

I fear nowhere really wild. H. D. G.

ORNITHOGALUM NUTANS. Linn. . . . . e. nc. — w.

Crostwick Wood, Burnham Westgate, Rev. Kirby Trimmer.

Wallington (escaped) Rev. G. Munford.

„ UMBELLATUM. Linn. . . . . e. nc. sc. —

St. Benet's Abbey, Paget.

Old Buckenham, Rev. K. Trimmer

Wighton, Rev. E. W. Dowell.

SCILLA NUTANS. Sm. . . . . e. nc. sc. w.

MUSCARI RACEMOSUM, D. C. . . . . e. nc. — —

Norwich. Between Colkirk and Fakenham, Rev. E. W. Dowell.

ALLIUM VINEALE. Linn. . . . . — — sc. w.

Wiggenhall St. Mary Magdalen, Dr. Lowe.

„ OLERACEUM. Linn. . . . . — — sc. w.

Hartford Bridge, Rev. Kirby Trimmer. Fincham, Eng. Flora.

„ URSINUM. Linn. . . . . e. nc. — w.

NARTHECIUM OSSIFRAGUM. Huds. . . . . e. nc. sc. w.
COLCHICUM AUTUMNALE. Linn. . . . . — — sc. —
Pulham, B. G. Rev. Kirby Trimmer.

JUNCACEÆ.

LUZULA PILOSA. Willd. . . . . e. nc. — w.
„ SYLVATICA. Bich. . . . . e. nc. — w.
„ CAMPESTRIS. D. C. . . . . e. nc. — w.
„ MULTIFLORA. Koch. . . . . e. nc. — w.
b. congesta. . . . . — nc. — —
St. Faith's and Stratton. Herb. Sm.
JUNCUS ACUTUS. Linn. . . . . — nc. — w.
„ MARITIMUS. Sm. . . . . e. nc. — w.
„ CONGLOMERATUS. Linn. . . e. nc. — w.
„ EFFUSUS. Linn. . . . . e. nc. sc. w.
„ GLAUCUS. Sib. . . . . e. nc. sc. w.
„ OBTUSIFLORUS. Ehr. . . . . e. nc. sc. w.
„ ACUTIFLORUS. Ehr. . . . . e. nc. sc. w.
„ LAMPROCARPUS. Ehr. . . . . e. nc. sc. w.
„ SUPINUS. Mœnch. . . . . e. nc. — w.
N. Wootton, Dr. Lowe.
„ BUFONIUS. Linn. . . . . e. nc. sc. w.
„ GERARDI. Lois. . . . . e. — — w.
Recorded for his eastern division by Mr. H. C. Watson in Topl. Bot. Holme, Dr. Lowe.
„ COMPRESSUS. Jacq. . . . . e. nc. — w.
Yarmouth, B. G. Burnham Westgate, Rev. Kirby Trimmer.
„ SQUARROSUS. Linn. . . . . e. nc. sc. w.

CYPERACEÆ.

SCHŒNUS NIGRICANS. Linn. . . . . e. nc. sc. w.
CLADIUM MARISCUS. Brown. . . . . e. nc. sc. w.
RHYNCHOSPORA ALBA. Vahl. . . . . e. nc. sc. w.
BLYSMUS COMPRESSUS. Panz. . . . . e. nc. sc. w.
Holme, Dr. Lowe.

SCIRPUS ACICULARIS. Linn. . . . . e. — — —
Yarmouth, Herb. Sm.
Ormesby and Filby, Paget.
„ PALUSTRIS. Linn. . . . . e. nc. sc. w.
„ MULTICAULIS. Sm. . . . . e. nc. — w.
„ PAUCIFLORUS. Lightf. . . . . e. nc. — w.
Dersingham, Dr. Lowe.
„ CŒSPITOSUS. Linn.. . . . . e. nc. sc. w.
„ FLUITANS. Linn. . . . . e. nc. — w.
Mintlyn, Dr. Lowe.
„ SAVII. S. and M. . . . . e. — — w.
Recorded for "e." in Mr. H. C. Watson's Top. Bot. Holme Marsh, 1863, Dr. Lowe.
„ SETACEUS. Linn. . . . . e. nc. sc. w.
„ LACUSTRIS. Linn. . . . . e. nc. sc. w.
„ TABERNŒMONTANI. Gmel. . . . . e. nc. — w.
Hickling, Rev. Kirby Trimmer.
Cley, Eng. Fl. N. Wootton, Dr. Lowe.
„ TRIQUETER. Linn. . . . . e. — — —
Acle Dam, F.B., Rev. K. Trimmer's Flora.
„ MARITIMUS. Linn. . . . . e. nc. — w.
„ SYLVATICUS. Linn. . . . . e. — — —
Ditchingham, F.B., Rev. Kirby Trimmer.
ERIOPHORUM VAGINATUM. Linn. . . . . e. nc. — w.
„ ANGUSTIFOLIUM. Roth. . . . . e. nc. — w.
„ LATIFOLIUM. Hoppe. . . . . e. nc. — w.
CAREX DIOICA. Linn. . . . . e. nc. sc. w.
„ PULICARIS. Linn. . . . . e. nc. sc. w.
„ DIVISA. Huds. . . . . e. nc. — w.
„ DISTICHA. Huds. . . . . e. nc. sc. w.
„ ARENARIA. Linn. . . . . e. nc. — w.
„ TERETIUSCULA. Good. . . . . e. nc. — w.
„ PARADOXA. Willd. . . . . e. — — —
Hoveton, F.B., Rev. K. Trimmer.
„ PANICULATA. Linn. . . . . e. nc. sc. w.

CAREX VULPINA. Linn.	e.	nc.	sc.	w.
„ MURICATA. Linn.	e.	nc.	sc.	w.
„ DIVULSA. Good.	e.	nc.	sc.	w.
„ STELLULATA. Good.	e.	nc.	sc.	w.
„ REMOTA. Linn.	e.	—	sc.	w.
„ AXILLARIS. Good.	e.	nc.	sc.	—
„ CURTA. Good.	—	—	—	w.
S. Lynn, Rev. G. Munford.				
„ OVALIS. Good.	e.	—	sc.	w.
„ STRICTA. Good.	e.	—	sc.	w.
„ ACUTA. Linn.	e.	nc.	sc.	w.
„ VULGARIS. Fries.	e.	nc.	sc.	w.
„ GLAUCA. Scop.	e.	nc.	sc.	w.
„ LIMOSA. Linn.	e.	nc.	—	w.
„ PILULIFERA. Linn.	e.	nc.	—	w.
„ PRŒCOX. Jacq.	e.	nc.	—	w.
Castle Rising, Dr. Lowe.				
„ PALLESCENS. Linn.	e.	nc.	—	w.
„ PANICEA. Linn.	e.	nc.	sc.	w.
„ PENDULA. Huds.	e.	nc.	sc.	w.
„ STRIGOSA. Huds.	e.	nc.	—	—
„ SYLVATICA. Huds.	e.	nc.	sc.	w.
„ BINERVIS. Sm.	e.	nc.	—	w.
„ DISTANS. Linn.	e.	nc.	—	w.
„ FULVA. Good.	e.	nc.	sc.	w.
Holme, Dr. Lowe.				
„ EXTENSA. Good.	e.	nc.	—	—
„ FLAVA. Linn.	e.	nc.	sc.	w.
b. lepidocarpa.	—	—	—	w.
Recorded by Mr. H. C. Watson, Top. Bot.				
„ ŒDERI. Ehr.	e.	nc.	—	w.
Roydon, Dr. Lowe.				
„ FILIFORMIS. Linn.	e.	—	sc.	w.
„ HIRTA. Linn.	e.	nc.	sc.	w.
„ PSEUDO-CYPERUS. Linn.	e.	nc.	sc.	w.
„ PALUDOSA. Good.	e.	nc.	sc.	w.
„ RIPARIA. Curtis.	e.	nc.	sc.	w.
„ AMPULLACEA. Good.	e.	nc.	sc.	w.

CAREX VESICARIA. Linn. . . . . e. nc. — w.
Roydon, Babingley, Dr. Lowe.

GRAMINA.

SPARTINA STRICTA. Roth. . . . . — nc. — —
Cley, B. G. Rev. Kirby Trimmer.
DIGITARIA HUMIFUSA. Pers. . . . . — — — —
Norfolk, Br. Flora.
ECHINOCHLOA CRUS-GALLI. Beauv. . . . . — — sc. —
Thetford, Br. Flora.
SETARIA VIRIDIS. Beauv. . . . . e. nc. sc. w.
ANTHOXANTHUM ODORATUM. Linn. . . . . e. nc. sc. w.
DIGRAPHIS ARUNDINACEA. Linn. . . . . e. nc. sc. w.
PHALARIS CANARIENSIS. Linn. . . . . e. nc. sc. —
ALOPECURUS AGRESTIS. Linn. . . . . e. nc. sc. w.
„ FULVUS. Sm. . . . . e. nc. sc. —
„ GENICULATUS. Linn. . . . . e. nc. sc. —
„ BULBOSUS. Linn. . . . . e. nc. — —
Yarmouth, Br. Fl. Cley, Rev. Kirby Trimmer.
„ PRATENSIS. Linn. . . . . e. nc. sc. w.
PHLEUM PRATENSE. Linn. . . . . e. nc. sc. w.
b. nodosum. . . . . — nc. — —
Hellesdon, and Beeston near Cromer.—H.D.G.
„ SOEHMERI. Schrad. . . . . — — sc. w.
Narboro, Mr. B. D. Wardale. Hardingham, Rev. Kirby Trimmer.
„ ARENARIUM. Linn. . . . . e. nc. sc. w.
GASTRIDIUM LENDIGERUM. Gand. . . . . e. nc. — —
Gillingham and Cley, Br. Flora.
POLYPOGON MONSPELIENSIS. Desf. . . . . — nc. — —
Cley, W. Whitear.
„ LITTORALIS. Sm. . . . . — nc. — —
Cley, W. Whitear.
AGROSTIS SPICA-VENTI. Linn. . . . . e. nc. — w.
„ INTERRUPTA. Linn. . . . . — — sc. —
Thetford. Br. Flora.

AGROSTIS CANINA. Linn.	e.	nc.	sc.	w.
„ ALBA. Linn.	e.	nc.	sc.	w.
b. stolonifera.	e.	—	—	—
Thorpe, H.D.G.				
„ VULGARIS. With.	e.	nc.	sc.	w.
b. pumila.	—	—	—	w.
North Wootton, Dr. Lowe.				
PSAMMA ARENARIA. R. and S.	e.	nc.	—	w.
CALAMAGROSTIS EPIGEJOS. Roth.	e.	nc.	sc.	w.
„ LANCEOLATA. Roth.	e.	—	sc.	w.
PHRAGMITES COMMUNIS. Linn.	e.	nc.	sc.	w.
MILIUM EFFUSUM. Linn.	e.	nc.	—	—
CORYNEPHORUS CANESCENS. Beauv.	e.	nc.	—	w.
AIRA CŒSPITOSA. Linn.	e.	nc.	sc.	w.
„ ULIGINOSA. Weihe.	—	—	—	—
"e?" Mr. H. C. Watson's Top. Bot.				
„ FLEXUOSA. Linn.	e.	nc.	—	w.
„ CARYOPHYLLEA. Linn.	e.	nc.	sc.	w.
„ PRŒCOX. Linn.	e.	nc.	sc.	w.
AVENA FLAVESCENS. Linn.	e.	nc.	sc.	w.
„ PUBESCENS. Linn.	—	nc.	—	w.
„ PRATENSIS. Linn.	e.	nc.	—	w.
„ FATUA. Linn.	e.	nc.	sc.	w.
HOLCUS MOLLIS. Linn.	e.	nc.	sc.	w.
„ LANATUS. Linn.	e.	nc.	sc.	w.
TRIODIA DECUMBENS. Beauv.	e.	nc.	—	w.
KOELERIA CRISTATA. Pers.	e.	nc.	—	w.
MOLINIA CŒRULEA. Mœnch.	e.	nc.	sc.	w.
MELICA UNIFLORA. Retz.	e.	nc.	sc.	w.
CATABROSA AQUATICA. Beauv.	e.	nc.	sc.	w.
GLYCERIA FLUITANS. Brown.	e.	nc.	sc.	w.
„ PLICATA. Fries.	—	—	—	w.
„ AQUATICA. Sm.	e.	nc.	sc.	w.
SCLEROCHLOA MARITIMA. Lindl.	e.	nc.	—	w.
„ DISTANS. Bab.	e.	nc.	—	w.
„ PROCUMBENS. Beauv.	e.	nc.	—	w.
„ RIGIDA. Link.	e.	nc.	sc.	w.
„ LOLIACEA. Woods.	e.	nc.	—	w.

POA ANNUA. Linn.	e.	nc.	sc.	w.
„ BULBOSA. Linn.	e.	—	—	—
„ NEMORALIS. Linn.	e.	—	sc.	—
Thorpe, H. D. G. Lakenham, S. P. W.				
„ COMPRESSA. Linn.	e.	nc.	sc.	w.
„ PRATENSIS. Linn.	e.	nc.	sc.	w.
„ TRIVIALIS. Linn.	e.	nc.	sc.	w.
BRIZA MEDIA. Linn.	e.	nc.	sc.	w.
CYNOSURUS CRISTATUS. Linn.	e.	nc.	sc.	w.
DACTYLIS GLOMERATA. Linn.	e.	nc.	sc.	w.
FESTUCA UNIGLUMIS. Soland.	—	—	—	w.
Congham, Dr. Lowe.				
„ PSEUDO-MYURUS. Soyer.	e.	nc.	—	w.
„ SCIUROIDES. Roth.	e.	nc.	—	w.
„ OVINA. Linn.	e.	nc.	sc.	w.
b. tenuifolia.	—	nc.	—	—
Stratton, Herb. Sm.				
„ RUBRA. Linn.	—	—	—	—
a. duriuscula.	—	nc.	—	—
Swanington, H.D.G.				
b. arenaria.	e.	—	—	—
Yarmouth, H.D.G.				
„ SYLVATICA. Vill.	—	—	—	w.
Munford list in White's Directory.				
„ ELATIOR. Linn.	e.	nc.	—	w.
b. arundinacea	—	—	—	w.
Sea bank, Lynn, Dr. Lowe.				
„ PRATENSIS. Huds.	e.	nc.	sc.	w.
b. loliacea	e.	—	—	—
BROMUS GIGANTEUS. Linn.	e.	nc.	sc.	w.
„ ASPER. Murr.	e.	nc.	sc.	w.
„ ERECTUS. Huds.	—	nc.	—	—
Holkham, Rev. Kirby Trimmer.				
„ STERILIS. Linn.	e.	nc.	sc.	w.
„ SECALINUS. Linn.	e.	nc.	sc.	w.
„ RACEMOSUS. Linn.	e.	nc.	sc.	w.
„ COMMUTATUS. Schrad.	e.	nc.	—	w.
C. Rising, Dr. Lowe.				

BROMUS MOLLIS. Linn.	e.	nc.	sc.	w.
„ ARVENSIS. Linn.	e.	nc.	—	—
BRACHYPODIUM SYLVATICUM. R. & S.	e.	nc.	sc.	—
„ PINNATUM. Beauv.	e.	—	—	—
Earsham, B.G.				
TRITICUM CANINUM. Huds.	e.	—	—	w.
„ REPENS. Linn.	e.	nc.	sc.	w.
„ ACUTUM. D.C.	e.	nc.	—	w.
„ JUNCEUM. Linn.	e.	nc.	—	w.
LOLIUM PERENNE. Linn.	e.	nc.	sc.	w.
„ ITALICUM. Braun.	e.	—	—	w.
„ TEMULENTUM. Linn.	e.	nc.	sc.	w.
b. arvense	e.	—	—	—
Hemsby, Paget.				
LEPTURUS FILIFORMIS. Trin.	e.	nc.	—	w.
W. Lynn, Dr. Lowe.				
ELYMUS ARENARIUS. Linn.	e.	nc.	—	w.
HORDEUM PRATENSE. Huds.	e.	nc.	sc.	w.
„ MURINUM. Linn.	e.	nc.	sc.	w.
„ MARITIMUM. With.	e.	nc.	—	w.
NARDUS STRICTA. Linn.	e.	nc.	—	w.

ACOTYLEDONOUS PLANTS.

FILICES.

PTERIS AQUILINA. Linn.	e.	nc.	sc.	w.
LOMARIA SPICANT. Desv.	e.	nc.	—	w.
ASPLENIUM RUTA MURARIA. Linn.	e.	nc.	sc.	w.
„ TRICHOMANES. Linn.	e.	nc.	sc.	w.
„ ADIANTUM-NIGRUM. Linn.	e.	nc.	sc.	w.
b. acutum	—	—	—	w.
Roydon, near Lynn, Dr. Lowe.				
ATHYRIUM FILIX FÆMINA. Bernh.	e.	nc.	—	w.
CETERACH OFFICINARUM. Willd.	—	nc.	—	—
Heydon Church.				
SCOLOPENDRIUM VULGARE. Linn.	e.	nc.	sc.	w.

CYSTOPTERIS FRAGILIS. Bernh. . . . . e. — sc. —
Norwich, 1835, S. P. Woodward.
The "sc." locality being still in existence is suppressed for obvious reasons, H.D.G.

ASPIDIUM ACULEATUM. Sw. . . . . e. nc. sc. w.
b. lobatum . . . . . e. nc. sc. w.
„ ANGULARE. Willd. . . . . e. nc. sc. —

NEPHRODIUM FILIX MAS. Rich. . . . . e. nc. sc. w.
„ CRISTATUM. Rich. . . . . e. nc. sc. w.
Surlingham, Edgefield, Scoulton, Bawsey.
„ ULIGINOSUM. . . . . — nc. sc. w.
Edgefield, Rev. Kirby Trimmer.
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„ THELYPTERIS. Desv. . . . . e. nc. — w.
„ OREOPTERIS. Desv. . . . . e. nc. — w.
Felthorpe, Blickling, Beeston by Cromer, 1875, H.D.G.
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POLYPODIUM VULGARE. Linn. . . . . e. nc. sc. w.
OSMUNDA REGALIS. Linn. . . . . e. nc. — w.
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LYCOPODIUM CLAVATUM. Linn. . . . . e. nc. — w.
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Swanington, H.D.G.
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Felthorpe, Mr. Wigham.

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EQUISETACEÆ.

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TRANSACTIONS

OF THE

Norfolk and Norwich

NATURALISTS' SOCIETY;

Presented to the Members for

1876–77.

VOL. II.—PART III.

Norwich:
PRINTED BY FLETCHER AND SON.
1877.

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	£	s.	d.
To Balance from last year	21	1	1
,, Subscriptions, 5 for 1875—76; 154 for 1876—77 ...	39	15	0
,, Additional payments for monthly notices	0	18	0
,, Donations towards printing the White-Marsham Correspondence—			
Rev. H. P. Marsham... ... ... £ 2 0 0			
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,, Sale of *Transactions*	11	5	6
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Cr.

	£	s.	d.
By Fletcher and Son, for Printing *Transactions*, 1875—76	33	15	6
,, Ditto, for White-Marsham Correspondence, separate copies	3	3	0
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,, Advertisement in *Nature*	0	10	6
,, Postage, Stationery, and Carriage	3	16	9
,, Museum Subscription	2	2	0
,, Assistant Secretary's Salary	5	0	0
,, Balance in hand	27	11	11
	£83	2	2

Examined and found correct,

W. H. BIDWELL, *Auditor.*

List of the publications received by the Society as Donations or Exchanges, from March 1876 *to March* 1877.

GURNEY (J. H. JUN., F.Z.S.).

Rambles of a Naturalist in Egypt and other countries; with an Analysis of the claims of certain Foreign Birds to be considered British, and other Ornithological Notes. 8vo. *London*, 1876

From Mr. Thomas Southwell, F.Z.S.

MEADE (R. H.).

Monograph upon the British Species of *Sarcophaga* or Flesh-fly. [Reprinted from "The Entomologist's Monthly Magazine, Vol. XII.]

From Mr. Charles Williams.

NAPIER (CHARLES OTTLEY GROOM).

The food, use, and beauty of British Birds. 12mo. *London*, 1865

From Mr. H. B. Woodward, F.G.S.

PARFITT (EDWARD).

The Fauna of Devon, Part XIV. Birds: by Edward Parfitt. [Reprinted from the Transactions of the Devonshire Association for the advancement of Science, Literature, and Art, 1876.]

From the Author.

BELFAST.

Annual Report and Proceedings of the Belfast Naturalists' Field Club, for the years ending 31st March, 1875—76. (12th and 13th years.) New Series, Vol I, Parts 2, 3. 8vo. . . . *Belfast*, 1875—76

From the Belfast Naturalists' Field Club.

BRISTOL.

Proceedings of the Bristol Naturalists' Society. New Series, Vol I. part 3. 8vo. . . *Bristol*, 1876
From the Bristol Naturalists' Society.

CARDIFF.

Cardiff Naturalists' Society. Reports and Transactions. Vols. II—VII, 1868—9 to 1875. 8vo.
Hertford and Cardiff, 1870—76
From the Cardiff Naturalists' Society.

EDINBURGH.

Transactions and Proceedings of the Botanical Society. Vol. XII, parts 2 and 3. 8vo. *Edinburgh*, 1875—76
From the Botanical Society of Edinburgh.

GLASGOW.

Proceedings of the Natural History Society of Glasgow. Vol. II, part 2; Vol. III, part 1. 8vo.
Glasgow, 1876
From the Glasgow Natural History Society.

LEEDS.

The Leeds Naturalists' Club and Scientific Association, 1875—1876. The Sixth Annual Report and President's Valedictory Address; with a brief sketch of the Society's History, &c. 8vo. . . *Leeds*, 1876

Constitution of the Leeds Naturalists' Club, and Scientific Association, as adopted at a Special General Meeting, held February 23rd, 1876. 8vo. . *Leeds*, 1876
From the Leeds Naturalists' Club.

LEWES.

The Twelfth Annual Report of the Lewes and East Sussex Natural History Society. 12mo. . *Lewes*, 1876
From the Lewes Natural History Society.

LIVERPOOL.

Proceedings of the Liverpool Naturalists' Field Club, for the year 1875—76. 8vo. . . *Liverpool*, 1876
From the Liverpool Naturalists' Field Club.

LONDON.

Notices of the Proceedings at the Meetings of the Members of the Royal Institution of Great Britain, with abstracts of the Discourses delivered at the Evening Meetings. Vol. VII, 1873—1875. Vol. VIII, parts 1 and 2. 8vo. *London*, 1875—76

From the Royal Institution.

NEW ZEALAND.

Transactions and Proceedings of the New Zealand Institute, 1875. Edited and published under the authority of the Board of Governors of the Institute. Vol. VIII, issued May, 1876. 8vo. . . *Wellington*, 1876

Catalogue of the Stalk- and Sessile-eyed Crustacea of New Zealand; by Edward J. Miers, F.L.S. 8vo. *London*, 1876

From the New Zealand Institute.

NORWAY.

On some Remarkable Forms of Animal Life, from the great deeps off the Norwegian Coast. Part 2. Researches on the structure and affinity of the genus *Brisinga*, based on the study of a new species, *Brisinga Coronata;* by George Ossian Sars, Professor of Zoology at the University of Christiania. 4to. . *Christiania*, 1875

Windrosen des südlichen Norwegens. Mit der Goldmedaille König Carls XV. belohnte Abhandlung von C. de Seue. Universitätsprogram für das erste Semester, 1876, herausgegeben von Prof. H. Mohn. 4to. *Kristiania*, 1876

Etudes sur les Mouvements de l'Atmosphère, par Prof. C. M. Guldberg, et Prof. H. Mohn. Première partie. 4to. *Christiania*, 1876

Transfusion und Plethora. Eine Physiologische Studie, von Jakob Worm Müller, Professor der Physiologie. 8vo. *Christiania*, 1875

Prœveforelæsninger til Concurrence om den Medicinske Professorpost. Marts, 1873. roy. 8vo.

NORWAY.—*Continued.*

Enumeratio Insectorum Norvegicorum. Fasciculus II., Catalogum Coleopterorum continens; auctore H. Siebke. Fasciculus III., Catalogum Lepidopterorum continentem, auctore H. Siebke, defuncto, edidit J. Sparre Schneider. 8vo. . . . *Christiania*, 1875—76

From L'Université Royale de Norvège à Christiania.

PLYMOUTH.

Annual Report and Transactions of the Plymouth Institution, and Devon and Cornwall Natural History Society. Vol. V, parts 2 and 3, 1874—76. 8vo. *Plymouth*, 1875—76

From the Plymouth Institution.

UNITED STATES OF AMERICA.

Report of the United States Geological Survey of the Territories; by F. V. Hayden, U.S. Geologist-in-charge. Vol. II. The Vertebrata of the Cretaceous Formations of the West; by E. D. Cope. Vol. X. A Monograph of the Geometrid Moths, or Phalænidæ, of the United States; by A. S. Packard, jun., M.D. 4to.

Washington, 1875—76

Annual Report of the United States Geological and Geographical Survey of the Territories, embracing Colorado and parts of adjacent territories; being a Report of Progress of the Exploration for the year 1874; by F. V. Hayden, U.S. Geologist. 8vo.

Washington, 1876

From Dr. F. V. Hayden, United States Geologist-in-charge.

WATFORD.

Transactions of the Watford Natural History Society and Hertfordshire Field Club. Vol. I, parts 4 and 5. 8vo.

Watford, 1876

Watford Natural History Society and Hertfordshire Field Club. Founded 23rd January, 1875. List of Members, Laws, and Catalogue of the Library. 8vo.

Watford, 1876

From the Watford Natural History Society.

ADDRESS

Read by the President, MR. T. G. BAYFIELD, *to the Members of the Norfolk and Norwich Naturalists' Society at their Eighth Annual Meeting, held at the Norfolk and Norwich Museum, March 27th,* 1877.

LADIES AND GENTLEMEN—On taking office the members of this Society will remember that I expressed a fear, that however anxious to perform my duties as President, my very limited leisure would prevent such attention being given to the objects of the Society as their importance might deserve; and I must crave your indulgence for the many short-comings in my notices of the papers read during the session.

Among those essays which do not appear in our proceedings, were several of considerable interest, illustrating as they did many subjects in Natural History, not so generally known as they ought to be. These include an account of a visit made by our Secretary in the autumn of 1875, to Norway, replete with notes on manners, customs, and the natural features of a part of Europe seldom visited by Englishmen, except for purposes of sport; but which appears for many reasons worthy of more extended research, and we hope yet to hear much more of the home of the ancient Vikings, and of a people so intimately connected with the early history of our islands, and whose influence upon our national character and language has been so great and lasting.

At the June meeting, Mr. J. H. Gurney, jun., gave an interesting account of a visit to the Bass Rock, in which he said, the first recorded visit by a naturalist to this spot is that on August 19th, 1661, by Ray and his pupil Willughby; and on the same day in the year 1835, Audubon and his friend Macgillivray landed there. Passing over the historical portion of the paper we are told, that the present rent of the

island is £20 per annum: in Ray's time it fetched £100; but when he wrote, young gannets were eaten even at the royal table: now none but the poorest will touch them, and the principal profit is derived from the feathers. Incubation is very protracted, and the lessee finds that the Sea Birds' Act does not provide a close time of sufficient duration to enable the young birds to be strong enough on the wing to leave the nest and provide for themselves. Every old bird shot in August or September leaves a young one to starve in the nest. Let us hope, that when that Act is revised and amended, an extension of the close time may be arranged to meet the requirements of the Solan Goose. The continuation of the paper, with the promised account of Flamborough Head, is looked forward to with much interest.

Mr. Bridgman's notes on an afternoon trip to Poringland are full of life and the vigour of an ardent student of nature, and opened a field for observation as to the habits of some of the small but not less useful mammalia; and the description he gave us of the method by which a weasel attacked a rat, shows how much we are indebted to this abused little animal, for assistance to keep in check that expensive and destructive denizen of our farm yards, the rat. Mr. Bridgman recounted several instances of that mimicry of the colours of surrounding objects, the use of which is to preserve the caterpillars from observation; and stated that he had written the paper in the hope that other members would furnish to the Society their observations on such noticeable facts as probably would be met with during our excursions, a hope that has at present been imperfectly realized.

At our July meeting, Mr. Stevenson exhibited a skin of *Charadrius fulvus*, the Eastern Golden Plover, killed in Norfolk, a species allied to our own Golden Plover, rare in Europe, but now occurring for the first time as a visitor to Britain. A Japanese example was exhibited for comparison, both kindly lent by Mr. H. E. Dresser. A notice of the discovery will be found at p. 213 of last year's Transactions.

For a description of *Delphinus albirostris* taken at Lowestoft, the skeleton of which was secured for the Museum of Comparative

Anatomy at Cambridge, I would refer to the "Occasional Notes" in our Report.

In September, the Rev. J. Crompton exhibited a most valuable collection of bones of several species of Moa from New Zealand, sent by Dr. Julius Von Haast, for the Norwich Museum; each bone carefully identified as to species, and in sufficient numbers to illustrate the structure of these remarkable birds, the extinction of which took place at probably a very recent date.

The approaching exhaustion of the seal as a British resident gave an additional but painful interest to Mr. Southwell's paper on the British *Pinnipedia*. The walrus has been seen at the Orkneys so lately as 1857; but from the activity with which the chase of this species is being carried on by the northern sealers, the stations of this remarkable animal must eventually become more remote, and the chances of a visit from a straggler less probable. The seal, once a numerous visitor to our shores is now far less common. In his day, Sir Thomas Brown mentions it as frequently taken, sleeping on the shore; and that it was a regular visitor in the rivers, is evident from the fact, that at Ipswich its capture seems to have been systematically carried on, as bone harpoons used for that purpose have been recovered from the mud of the Orwell, and were in the collection of the late Mr. William Fitch, of Ipswich.

The papers which the Journal Committee have decided to publish, will speak for themselves, and require no eulogy from me. The success of the attempt to naturalize the edible frog (*Rana esculenta*), seems now established. Professor Newton's account of his re-discovery of the species, will be read with interest.

Mr. Bridgman's notes on the *Hymenoptera*, show how much may yet be added to our recorded knowledge, by the energetic persistent labours of a single individual.

Mr. Plowwright's paper on the Brandon *Fungi*, exhibits in a remarkable degree the extent to which this class may be developed under favourable circumstances, even in so restricted an area as a sawdust heap. In this branch of botany we thus owe to a member of our Society, the addition of a species new to science, the

identification of two others hitherto unknown to Britain, and a third, once only found in Scotland.

Mr. Cordeaux's observations on the migration of the Stone-chat, throw one more ray of light on this mysterious subject, and disclose a line of migration, hitherto I believe, unsuspected.

The memoir of Mr. Lilly Wigg, F.L.S., by Mr. Hampden Glasspoole, cannot fail to be interesting to Norfolk botanists, as a record of a man whose labours have never been fully recognized; but who as a contemporary of Mr. Dawson Turner and Sir J. E. Smith, seems to have been in the habit of contributing information, the value of which was more frequently appreciated than recorded.

As a contribution to the geological history of the county, the list of extinct mammalia by Mr. Randall Johnson, must be looked on as especially opportune. The identification of species from mere fragments of their bones, horns, or teeth, necessitates very careful, and sometimes fatiguing research; and the pioneers of a new science in fresh districts, meet with difficulties and disappointments such as can be understood only by those who have experienced them; for after a laborious comparison of specimens to be sought for in distant collections, the discovery of a single fresh example, may upset the conclusions arrived at by the labour of weeks. The careful record of the deposits from which these mammalian remains have been derived, affords a clue to the climatal conditions under which the animals lived, and the existing species of the genera represented, supply a reasonable ground for conjecture as to the localities whence the immigration took place; I say "conjecture," because in many instances the bones and teeth are not of necessity coeval with the beds in which they are now found. Very many of the clays and sands of the tertiary period, have been formed from the repeated destruction and re-deposition of previous fossiliferous beds; the more solid animal remains alone, escaping destruction during the rough process of transportation; in fact many shew by their abraded and polished surfaces, long continued action of water and sand. Mr. Johnson modestly expresses an opinion, that with increased opportunities of comparison, future discoveries may add more species to the list—may the

new found examples meet with as faithful and indefatigable a registrar, as Mr. Johnson has shewn himself to be.

To Mr. Stevenson, we are indebted for a continuation of those valuable ornithological notes, which have in former years added so much of value to our reports : these and the meteorological tables by Mr. J. Quinton, junr., have formed annual features in our Transactions, and contain facts of more than passing interest. Fortunate for science would it have been, had such records been bequeathed to us by the observers of past generations. The occasional notes contain memoranda which we trust will also be found worthy of record.

There remains but one paper to be noticed, which is Mr. F. Kitton's list of *Diatomaceæ* : a continuation of the Fauna and Flora of Norfolk, and the seventh portion of that subject. Minute as these organisms may be, that they perform important duties in the economy of nature is beyond a doubt ; but in the inquiry what those duties may be, and how they are performed, it will certainly be essential, that our views be founded on correct observations. That the work is in the hands of Mr. Kitton, is a guarantee that the information conveyed on the *Diatomaceæ*, is fully up to the most advanced standard of microscopical research.

An excursion made on June the 13th, by the Society, to Pedham, Hemblington, and Blofield, by the kind permission of Mrs. Burroughes, under the leadership of Mr. R. P. Burcham, resulted in the discovery of a fresh locality for *Pyrola minor*. Ferns in great luxuriance skirt the upper portions of the ornamental water, to retain which, the dam is maintained. *Lastræa spinulosa* is abundant there, and also *Carex pseudo-cyperus* and *Luzula campestris*, var. *compacta ; Polygonum amphibium* finds a congenial habitat in the quiet lake, and as a thing of beauty, is well worthy of the pencil of the artist. In the coach house hung several nets used for dragging the lake; and in a fold of these, a wren had built, and had just reared her brood at the time of our visit. After a drive round by Hemblington Church, and tea at Blofield, we returned home much pleased with our trip.

On July the 11th, the Society by invitation from Rev. J. A. Laurence, who most hospitably entertained us, made their next

excursion to Dilham and Honing. The day was fine, the scenery varied, and many objects were observed by the members; of which perhaps, none was more strange to the majority of those present, than a young cuckow, nearly ready to fly, but which Mr. Laurence had enclosed in the nest with a wire frame, to allow us to inspect him with greater convenience. The islands at Dilham, planted by the late Mr. Shepherd Taylor, were by the courtesy of his son Mr. H. Taylor, thrown open to us; and after rowing round the canals and an inspection of the woods, we, following the course of the river above Horning Mills, inspected some good botanizing ground in the pits whence the turf had been cut; the plants gathered, being *Veronica scutellata*, the three species of *Drosera*, two species of *Utricularia*, *Ranunculus lingua*, and the usual grasses and sedges of our marshes. Especial thanks are due to Rev. J. A. Laurence, for his courtesy and kindness to us on the occasion.

By permission of Charles Marsham Esq., the almost classic woods of Stratton Strawless, were thrown open to our Society for our August excursion; and as, since the publication of the White—Marsham correspondence in the last part of our Transactions, the chronicles of those woods have become famous, not only within their immediate neighbourhood, but in the annals of tree culture generally, the Society found very much to be remembered in that visit. I regret being personally unable to be present, but the visit is well remembered as a most enjoyable one, by those who formed the party. I bear that *Atropa belladonna*, and *Gentiana campestris*, were found during the day at Stratton, the former abundantly.

In the study of Vegetable Teratology, our tables have frequently been decked with specimens illustrating either accidental, or varietal deviations from the normal forms of many of our British plants; and I think it due to our friend Mr. R. P. Burcham, to acknowledge the assiduity with which these have been collected for our meetings. And we have also to thank Mr. George Asker for specimens of a variety of Dahlia, and another of the China Rose, in both of which, the petals are of a bluish green tint: these were cut from plants grown by himself, which constantly exhibit that peculiarity.

This branch of Botany is one of great interest, and as we become better acquainted with these structural variations, our knowledge of the normal conditions will be much assisted.

Our thanks are due also to Miss Barnard, for frequent exhibitions of growing plants collected by herself in the Alps and south of Europe.

In Animal Life I do not remember any specimens exhibited that call for a remark; but the recent discovery of *Dentigerous* birds in the cretaceous beds of the United States, comprising many forms that assist to bridge over the great gap between the birds and reptiles, is likely, when we know more of them, to add many illustrations in proof of the marvellous theory of evolution.

Much has been said, and more doubted, as to the self-contained power of a species to modify its specific characters, to suit altered circumstances of temperature and habitat: but a recent series of observations by Surgeon-Major Day, read before the Linnean Society in January last, has shewn, that in certain fishes, notably the *Anabas* or climbing perch, and the *Ophiocephalus*, the gills have undergone a deterioration, so as to render them insufficient for water breathing—while the office of a lung is performed by the swim-bladder—and while either of these fishes can live for days on half dry mud-flats, the latter cannot exist for more than an hour or two, without a direct supply of air; and *Anabas*, according to Dr. Dobson, is dronwed as easily as a dog.

But in another and higher group, the Salamanders, we find exemplified in the Mexican gilled Salamander or Axolotl, the most remarkable and extensive change—a batrachian converted as it were into a lizard, by a change of the conditions of its habitat.

In 1867, Duméril communicated to the Academie, the extraordinary fact, that out of the many hundred axolotls in the Jardin des Plantes, thirty had lost their gills, forsaken the water for the land, and assumed the form of what had hitherto been considered the distinct genus *Amblystoma;* this Amblystoma being a true land salamander, breathing air only by lungs. This announcement naturally created great interest, not because a water-breathing salamander had changed into an air-breather, for this can be seen any

spring in the case of the common newt; but because the gilled larval form was capable of reproduction, and had therefore naturally been considered as an adult. No cause could be assigned for this strange and sudden assumption of a higher mode of life; for the converted axolotls had been exposed to no different conditions to their unconverted fellows.

Duméril tried the experiment of cutting off the gills of an ordinary axolotl; but the animal only produced a new set of gill-tufts, and stuck pertinaciously to its old habits. Lately, however, a German lady, Fräulein Marie von Chauvin, has overcome all difficulties, and triumphantly evolved Amblystoma out of more than one axolotl, by gradually accustoming the animal to live on land, and by paying throughout the process the greatest attention to health and diet; and believing that a description of her labours will be instructive to our members, I will briefly recount her plans. At first the five specimens selected were kept in a tank not quite covered with water, but they did not thrive; so the supply of water was increased, and on restoration to health, they were indulged in shallow water by day, and a deeper bath at night. They now throve perfectly well, but showed no disposition to metamorphosis, and actually retrogressed in development: they were then placed on land as they were, gills and all; but the change was not favourable: they lost appetite, and free cutaneous respiration, so essential to the comfort of an amphibian was impeded by particles of earth and moss adhering to their slimy skins. A tepid bath twice a day remedied that difficulty; but then the skin dried so rapidly, that the process of casting it became difficult, and eventually they were kept moist in wet moss after their bath. Three out of the five specimens made up their minds to die rather than improve, and after having lived fifty days on land they died from obstinately refusing their worm diet: at the time of their death, however, the gill-tufts, tail-fins, and other larval characteristics had already become much reduced. The behaviour of the two remaining specimens was more satisfactory: they showed a marked decrease in the size of gill-tufts and tail-fin after they had lived a few days on land; before long the atrophy of the gill-tufts

had gone on to such an extent, that though the animal when placed in water displayed them as usual, they were useless for breathing purposes, and every effort was used to regain the land.

Fräulein von Chauvin makes the suggestive remark, that the gills and tail-fin seem to shrivel by an actual drying process through the action of the air; not by the true process of absorption by the vital processes of the animal itself. This is important as it shows how the first airbreathing amphibia (*Caducibranchiata*) may have been evolved from double breathers (*Perennibranchiata*) by a succession of dry seasons, that is, by purely mechanical causes.

Further changes went on. The skin was cast several times, the gills disappeared altogether, and the gill clefts closed; the dorsal ridge, and tail-fin vanished, and the tail became rounded; the toes assumed a longer and rounder form, and were hardened with a horny deposit at the tips; the eyes became larger and more prominent; the skin lost its black slimy appearance, becoming at first black shot with green, and finally brownish black, with a violet shimmer, spotted on the throat and belly with yellow. Thus the complete Amblystoma form was assumed, and with the change of body a change of disposition, both animals being now of an astonishing greediness.

The converse of this series of experiments were made by the same observer. All salamanders, newts, frogs, and toads, lay eggs, from which gilled tadpoles are produced: but the black Alpine Salamander found at an elevation of more than one thousand feet, lacks the requisite pools for its aquatic life; and in correspondence with its altered surroundings, the young are born alive and fitted for terrestrial life, having possessed gills only *in utero*, where they of course were useless. Von Siebold tried whether the ripe fœtus would live in water, but was unsuccessful. Fräulein von Chauvin was however more skilful, and of two specimens one died; the other in the course of four days cast off its large gills, developed a new set of an abnormal form, and lived a fish life for fifteen weeks, usually remaining at the bottom of the tank. The gills then disappeared, and the true form of *Salamandra atra* was gradually assumed.

Here we have a reversed state of things; and the animal has by a reversed process fitted itself for an aquatic life, although its progenitors had been for generations untold, real airbreathers.

To those of our members who have an aquarium of a capacity of two gallons or upwards, I would recommend the observation of the development of the batrachians from the egg. In the course of a few weeks those of the frog and toad are easily to be obtained from our ponds and ditches. About a score will be sufficient for such a vessel as I have mentioned; they are no trouble, require but little food, and are by no means particular as to what; the only caution required being to give them nothing fresh till they have consumed their last rations; and when the approaching change from the larval to the full grown stage shows itself, to give them a piece of floating wood to rest and air themselves upon. In such an aquarium about twenty years since, I saw in the possession of the late Mr. B. B. Woodward, at Bungay, a newt which had retained its gills until full grown; and I remember that none of our naturalists were able to account for this anomaly. On its death it was sent to the British Museum, where it excited considerable interest, and elicited the remark—"What can this mean? You have been rearing an American form from a British newt." Fräulein von Chauvin's observations have given an explanation of the mystery.

In conclusion, let me congratulate the Society on its continued success; it being financially as well as numerically stronger than at any previous period.

We have to regret the death during the past session, of a veteran naturalist, the Rev. Richard Lubbock; a name long to be held in esteem by those who enjoyed a personal intercourse with him; as well as that larger section of the observers of the present day, to whom that delightful work "The Fauna of Norfolk" has proved a volume as truthful and fascinating as even Gilbert White's History of Selborne. A biographical notice of Mr. Lubbock by Mr. Stevenson will be found in our Transactions, and to this I refer you for more complete information.

Miss Martineau of Bracondale, has also been removed by death

from our list of members. In natural history she took a lively interest, and had been a member of the Society from its commencement.

Allow me in retiring from an office which I cannot but feel has been but inadequately served by me, to express my sincere thanks to our respected and indefatigable Secretary for the constant and ready assistance he has so freely rendered to me at all times, and to whose energy I cannot doubt the present prosperity of the Society is mainly to be attributed. And in welcoming my successor to the presidency, let me request for him the same cordial support from every member with whom he may be brought in contact, as it has been my good fortune to experience.

I.

ON THE NATURALIZATION OF THE EDIBLE FROG (*Rana esculenta*) IN NORFOLK.

By Alfred Newton, M.A., F.R.S., &c.

Read July 25th, 1876.

Having lately had the good luck to find that the Edible Frog was still an inhabitant of Norfolk instead of having become extinct there, as others besides myself had feared, it may be agreeable to the members of the Society to be placed in possession of such facts as I can supply with regard to the introduction of this animal into the county, and its subsequent shiftings of station therein.

To begin at the beginning, I will quote the following extracts from a paper communicated by me in 1859 to 'The Zoologist' (pp. 6538—6540):—

"On the 8th of June, 1853, as my brother Edward and myself were driving along the road between Thetford and Scoulton, in the county of Norfolk, we heard a most singular noise, and one we were unable to attribute to any cause known to us, proceeding from an adjacent field. We stopped, and he, getting out, entered the field,—a small meadow,—presently returning to me with the information that the extraordinary sounds came from a pond, hitherto hidden by the hedge, and that the utterers of them were no other than* edible frogs. Of course I went immediately to satisfy myself, and there, sure enough, were the frogs—some swimming to-and-fro in the water, some sitting on the aquatic plants, with which the pond was choked, and these last were exceedingly noisy, puffing out their faucial sacs, like so many dwellers in the cave of Æolus. After observing them for a little while, we tried to obtain some specimens, but herein fortune favoured the frogs: we had no aggressive weapons beyond a walking-stick and an umbrella, and they were wary to a degree and exceedingly active. However, by persevering we became possessed of four individuals, three, I regret to say, dead, and one,

* The printer here introduced a superfluous "the," which I now omit.

an indiscreet youth whom we found rambling about the grass, alive. By the time these were obtained our offensive operations had so be-muddied the pool and disturbed the growth of the water-weeds, that the rest of the colony sought safety in its turbid depths, and we could discover no more. We therefore retired with our spoils: the deceased were decently embalmed, and are now in the Norfolk and Norwich Museum. Our prisoner survived the journey home and lingered for three months in a foot-tub, usually re-ting on a floating island of cork, from which he would leap into the water whenever a fly was thrown for him on to its surface, and seizing it swim back to his station, when he disposed of it in about two gulps, though, indeed, if it happened to be a large blue-bottle a faint buzzing might be heard for some seconds after it had disappeared from the light of day.

"I lost no time in communicating the discovery we had made to Mr. J. H. Gurney, who in reply informed me that some years before Mr. George Berney had imported a great many animals of this species alive, and had liberated them in this country. Here the matter rested until a few days ago, when I received from the gentleman last named an account of his proceedings, and, having his permission to do so, I extract some portions of his letter written from Morton Hall, Norwich, March 25, 1859, which, I think, will be found interesting. Mr. Berney says:—'I went to Paris in 1837; some letters which I wrote from that place, and which now lie before me, fix the date with certainty: I brought home two hundred edible frogs and a great quantity of spawn. These were deposited in the ditches in the meadows at Morton, in some ponds at Hockering, and some were placed in the fens at Foulden, near Stoke Ferry.

"'They did not like the meadows and left them for ponds. I found some in a pond at the top of Honingham Heights, near the old telegraph. I have measured the distance on a map, three chains to an inch, this morning, and find it to be in a straight line 1¾ mile and forty yards. In the whole distance there is not one drop of water, not a puddle as big as a hand-bason, to be found between the meadows where they were placed and the pond in which I saw and heard them. It is impossible to mistake their cry or the two bladders that stick out of their heads when they cry.

"'In 1841 I imported another lot from Brussels. In 1842 I brought over from St. Omer thirteen hundred in large hampers made

like slave-ships, with plenty of tiers; these were moveable and were covered with water-lily leaves stitched on to them, that the frogs might be comfortable and feel at home. These were dispersed about in the above-mentioned places, and many hundreds were put into the fens at Foulden, and in the neighbourhood.'

"Now, the place where we found, in 1853, what were doubtless the descendants of Mr. Berney's importations, is nearly equidistant from the two districts mentioned by him in the above extracts, being about thirteen miles from each."

When I wrote the foregoing I thought it advisable for obvious reasons not to publish the name of the locality: but, now that this Society is pledged to the protection of the Fauna and Flora of the country, I have no scruple in imparting this information to my brother-members, and in stating that the pond where we found the frogs in 1853 is (or was—for I understand it has since been drained or filled up) in the parish of Rockland All Saints, and on the east side of the road upon which we were driving. The spot was visited by Mr. Southwell, to whom I had entrusted the knowledge of its precise position, in 1869, but—whether owing to bad weather or what other cause I am not aware—he was unsuccessful in hearing or seeing a single example; and I believe that he and others have since made ineffectual search in the same neighbourhood, so that until the 30th of May last, nothing more was known of the progeny of Mr. Berney's colonists.

Great therefore was my surprise and pleasure when, in the forenoon of the day just named, Lord Walsingham and I having arrived at the Stow Bedon station of the Thetford and Watton railway, my ears were a few minutes after saluted with sounds to which they had long been strangers. I at once knew the voice of the sweet singers and almost as soon perceived that the musicians were lodged in a little pond on the other side of the road which runs past the station, and hardly thirty yards from the station-door. To call my companion was not the work of many seconds, and he entered enthusiastically into the chase—for I naturally wished to obtain proof positive of the rediscovery—but that unerring eye and obedient hand which had so often triumphed over the mightiest beasts, the swiftest birds, and the tiniest moths, were long baffled by the wily amphibians. Stroke after stroke was "ducked" by the intended victim—time was getting on—in fancy I already heard

the whistle of the approaching train (which was fortunately very late)—when at last a blow more lucky than the rest laid one small *Rana esculenta* lifeless; and in compliance with Lord Walsingham's wish it has since been deposited in the Museum at Norwich.

While this onslaught was making, there came a man from the public-house hard by who, in reply to my questions told me that he had lived there for the last thirteen years and that these "noisy gentry," as he called the Frogs, had been tenants of the pond all that time. We were too much hurried to make many enquiries or any careful survey of the locality, but I saw that the pond was an artificial one—probably a clay-pit or gravel-pit—and that the overflow of water from it runs down a ditch beside the before-mentioned road which it separated from some broken ground, and I heard Frogs singing along this ditch for an hundred yards or so. The day was warm and the sun bright—two circumstances which called forth their melody, for, as Mr. Southwell knows by sad experience, it is lost labour to look for them in chill or dull weather—he having a few days after my visit—namely, on 4th of June—passed some time on the spot without gratifying his eyes or ears.

Mr. Berney has kindly informed me that he has not imported any Edible Frogs since the year last mentioned in the foregoing extracts; and as I do not think any one else is likely to have done so, we may fairly hold the animals that live at Stow Bedon to be the descendants of the colonies he planted; and thus the species has made good its existence in Norfolk for at least *thirty-four* years. I have lately learnt from Lord Walsingham that he has ascertained that it is pretty generally diffused in the neighbourhood of Didlington, shewing that it can maintain itself against Herons; and as I have not heard that any ranivorous propensities have been developed by the surrounding human population, we may now hope that it has successfully established itself and will continue to prosper in the county.

P.S.—It may be proper to observe that since these facts were communicated to the Society, I have published in 'The Zoologist,' for 1877 (p. 61), a brief account of the rediscovery.

II.

ON THE POLISH SWAN, *Cygnus immutabilis*, (Yarrell.)

By T. Southwell, Hon. Secretary.

Read 26th Sept., 1876.

Since Mr. Stevenson's excellent monograph which I have just read ("The Polish Swan," printed for private circulation), was written, I have had several additional opportunities of examining Norfolk killed specimens of the Polish Swan; and other important evidence has been accumulated, which tends greatly to strengthen my previous opinion, that the so-called *Cygnus immutabilis* is really a true species. The Polish Swan has actually been bred in confinement by Lord Lilford, producing white cygnets; and from these white cygnets his lordship has again bred another generation of white cygnets. Lord Lilford does not appear to have recorded this, and it was only in the course of conversation that it came to light. Upon being applied to by Mr. Stevenson, however, his lordship kindly wrote him full particulars of the occurrence, and at the same time expressed his decided opinion, that the species is a good one. Before, however, this was known, the Council of the Zoological Society, finding that the pair in their possession mentioned by Mr. Stevenson did not breed in their confined home in the gardens, determined to intrust them to Mr. J. H. Gurney, hoping that more liberty and a change of quarters might induce them to breed. In the spring of the present year they were, accordingly, sent to Northrepps, where they at once settled, and in due time made a nest, and out of six eggs, produced five young ones, three on the 21st, and two on the 22nd of May; these were a delicate buff colour when hatched, which gradually faded to pure white. When I first saw them on June 2nd, the buff tinge was hardly perceptible except on the back, which appeared of a rich creamy buff, with the under parts nearly pure white. On the 16th of June the largest cygnet was killed by a rat and nearly destroyed; and on the 27th July, Mr. Gurney wrote me, that the cygnets were beginning to show some feathers, which were "dull cinnamon brown, much like the first down." About the 10th of

August, the most backward and smallest cygnet died: it is the one I now exhibit, and agrees as to plumage with Mr. Gurney's description on the 27th July: you will perceive that the tail feathers which are now showing are pale yellowish buff, and that the wing coverts are the same colour, all the other parts from which the down has not yet been moulted are pure white. On the 20th of August I again saw the three cygnets; they had then assumed nearly all their feathers, and were more than half grown: the colour was white, apparently stained or sullied by a yellowish tint, which was strongest on the wing coverts; feet pale ash colour, and beak a purplish flesh colour, differing entirely from the lead colour of the bill in the young mute swan of the same age. The colour of the feet did not differ greatly from that of the young of the mute swan, and I agree with Mr. Stevenson, that at no stage of growth is this a character to be depended upon. When the breeze lifted the feathers upon the back of the young birds the buff tinge was more visible. There were also several peculiarities about the head, with which although very important, I will not trouble you.

I think it may be taken as proved, that there is a swan which produces white, or nearly white cygnets. With regard to Prof. Westerman's remarks to Mr. Gurney, that he had known a brood of mixed cygnets in Holland, and another instance recorded in the 'Field,' for July 8th, 1871, in which a pair of swans in Wales produced three white cygnets in a brood of the usual colour in one year, and a single one in another—the only instances of mixed broods I have ever heard of—I would say, that I have very little doubt one of the parents in each case was a Polish bird, or that they were of mixed blood. From the fact of more than one Polish Swan killed in this neighbourhood having been partially pinioned, I am led to believe, that although others have been undoubtedly wild specimens, there are birds of this species at large on our waters unknown to their owners; and that various degrees of infusion of Polish blood may account for individuals which I have observed in several ornamental waters partaking more or less of the characters of both species. Mr. J. H. Gurney, jun., has told me of such birds on the Serpentine, and at Gatton park; I have noticed others, and one on the lake in Battersea park, so far as I had an opportunity of observing it, appeared to me to be almost a pure Polander.

From what I have just said, mixed broods, or cygnets varying in colour, are just what we might expect; but so far from this being the case, I never could hear of any variation. Seventy cygnets now in the swan pit are as much alike as it is possible for them to be. Mr. Simpson who has had from seventy to a hundred through his hands yearly for the past thirty years, never saw a white cygnet. From this, I think, we may conclude that if there is a mixture of blood, the dark colour inherited from the Olor parent is so strong in the cygnet as not to be appreciably affected by the Polish strain, but that the characters which distinguish the Polish breed assert themselves at a later age. Mr. Gurney will doubtless report fully to the Zoological Society on the birds intrusted to his care; and as both Mr. Dresser, Prof. Newton, and Mr. Stevenson will have to give the subject their consideration in their respective books, now in the course of publication, we may hope soon to have the long vexed question finally settled.

March 12th, 1877. Mr. Gurney tells me the young Polish swans are now pure white, with the exception of the crown of their heads, and that from one of the two survivors even this small display of colour has nearly disappeared.

III.

NOTE ON FUNGI FOUND AT BRANDON.

BEING A LIST OF SPECIES FOUND IN THE MONTH OF NOVEMBER, 1876.

By Charles B. Plowright.

Read 30th January, 1877.

On Friday, November 8th, 1876, I visited Brandon at the suggestion of Mr. Thomas Southwell; with the intention of examining certain Fungi which had been observed by that gentleman, a week or two previously, growing upon a heap of sawdust near Brandon

station. This heap I was further told was of such dimensions that the sand-martins nested annually in it; a very interesting fact alone, and a sufficient guarantee of the permanency of the accumulation, so much so, that I felt sure a visit would be amply repaid. Through the kindness of the proprietors I had the opportunity of working over the whole yard, which has been accumulating for many years. The wood used is almost without exception of home growth, so no imported species were met with. Upon the sawdust heap above mentioned, *Boletus sulphureus*, a very handsome species was found. This has I believe not previously been found in England, although the Rev. J. Keith met with it near Forres, a year or two ago, where it likewise occurred upon sawdust. Several species of the *Myxogasters* were growing luxuriantly upon this heap of sawdust; some in great profusion as *Cribraria argillacea*, which covered several square feet of surface more or less closely.

Although late in the year a good number of *Hymenomycete* were met with, of which *Agaricus seminudus*, Lasch., and *Merulius aureus*, Fr., are new to the British flora. Of the smaller species perhaps the most interesting was a minute *Sphæria*, which grew in clusters upon the ground, in company with a black mould (*Helicoma mulleri*) its conidia. This plant will be described in an early number of Grevillea.

List of Fungi found at Brandon.

1. AGARICUS (LEPIOTA) ACUTESQUAMOSUS. Wm.
2. „ (LEPIOTA) CRISTATUS. Fr.
3. „ (LEPIOTA) SEMINUDUS. Lasch. A small but very well marked species, covered by a white pubescence, "floccoso-farinoso," and having the veil frequently attached in strips to the margin of the pileus. On one ground amongst chips. I am indebted to Mr. Berkeley for the name of this species, which has not previously been recorded in Britain.
4. AGARICUS (CLITOCYBE) NEBULARIS. Batsch.
5. „ (CLITOCYBE) MAXIMUS. Fr.
6. „ (COLLYBIA) VELUTIPES. Curt.
7. „ (MYCENA) GALERICULATUS. Scop.
8. „ (PLUTEUS) CERVINUS. Schœff: and its variety PETASATUS. Fr.

9. AGARICUS (PHOLIOTA) HETEROCLITUS. Fr. This fine species occurred in great profusion upon poplar trunks, very often growing horizontally from the ends of logs which had been sawn across; this seems to be its favourite site.

10. AGARICUS (PHOLIOTA) TOGULARIS. Bull. = A. ARRHENII. Fr. Epic. p. 161.

11. AGARICUS (PHOLIOTA) MARGINATUS. Batsch.

12. „ (FLAMMULA) SAPINEUS. Fr.

13. „ (CREPIDOTUS) MOLLIS. Schœff.

14. „ (HYPHOLOMA) FASCICULARIS. Hud.

15. „ (PSATHYRELLA) ATOMATUS. Fr.

16. LEPIOTA NUDA. Fr.

17. PAXILLUS PANUOIDES. Fr. Abundantly upon the sawdust heaps, but all the specimens seen were small.

18. LENZITES FLACCIDA. Fr.

19. BOLETUS SULPHUREUS. Fr. This splendid species was first found in Scotland by Rev. J. Keith, at Forres, a year or two ago. This gentleman informs me that it has since disappeared. Fries speaks of it as "*elegantissimus.*" It presents many very distinctive characters; being sulphur yellow in colour, tomentose, with a ventricose stem, which is often stained with carmine. Tubes at first short and golden, but as the plant matures becoming greenish in colour, and elongating until they attain a length of 2½ centimeters. Spores oval, 8—10 micromills long, by 3 wide. Unlike many Boleti the flesh is firm, and the plants are fasciculate. Young specimens change rapidly to blue when cut or bruised; old ones present many carmine stains. The mycelium which is abundant is of a bright golden hue. On the sawdust heap, where it was first observed by Mr. Thomas Southwell.

20. POLYPORUS CHIONEUS. Fr. On fir and larch.

21. „ ADUSTUS. Fr. On chips.

22. „ HISPIDUS. Fr.

23. „ VERSICOLOR. Fr.

24. „ VIOLACEUS. Fr. On Scotch fir.

25. „ VITREUS. Fr. On an old stump, fide M.J.B.

26. „ VAPORARIUS. Fr.

27. „ ABIETINUS. Fr.

28. MERULIUS CORIUM. Fr.

29. MERULIUS AUREUS. Fr. Running over chips, etc. A very pretty species, and new to our flora, for whose determination I have to thank Mr. Berkeley.

30. MERULIUS LACRYMANS. Fr.

31. GRANDINIA GRANULOSA. Fr.

32. THELEPHORA PUTEANA. Schum.

33. STEREUM PINI. Fr.

34. „ HIRSUTUM. Fr.

35. „ SANGUINOLENTUM. Fr.

36. AURICULARIA MESENTERICA. Bull.

37. CORTICIUM GIGANTEUM. Fr.

38. „ CÆRULEUM. Fr.

39. CYPHELLA CAPULA. Fr.

40. SOLENIA OCHRACEA. Hoffm.

41. CALOCERA CORNEA, Fr.

42. TREMELLA VISCOSA. Pers.

43. DACRYMYCES STILLATUS. Nees.

44. CYNOPHALLUS CANINUS. Fr. Amongst the sawdust.

45. ÆTHALIUM SEPTICUM. Fr. On sawdust.

46. CRIBRARIA ARGILLACEA. Pers. In profusion upon sawdust.

47. „ AURANTIACA. Fr. On fir bark.

48. TRICHIA FALLAX. Pers. On sawdust.

49. PERICHÆNA POPULINA. Fr. Upon poplar bark.

50. LICEA FRAGIFORMIS. Fr. On sawdust.

51. CRUCIBULUM VULGARE. Tul.

52. SPHÆROBOLUS STELLATUS. Tode.

53. TUBERCULARIA VULGARIS. Tode.

54. „ GRANULATA. Pers.

55. FUSARIUM LATERITIUM. Nees.

56. HELICOMA MULLEBI. Corda.

57. TRICHODERMA VIRIDE. Pers.

58. OZONIUM AURICOMUM. Pers.

(53–58: Non-autonomous species.)

59. OIDIUM FULVUM. Link. On sawdust.

60. PERISPORIUM VULGARE. Corda. On the inner bark of a poplar tree.

61. PEZIZA (SARCOSCYPHA) HIRTA. Schum.

62. „ (DASYCYPHA) VIRGINIA. Batsch.

63. „ (MOLLISIA) CINEREA. Batsch.

64. „ „ VULGARIS. Fr.

65. HELOTIUM CITRINUM. Fr.
66. PATELLARIA ATRATA. Fr.
67. BULGARIA INQUINANS. Fr.
68. „ SARCOIDES. Fr.
69. „ PURPUREA. Fckl.
70. HYPOCREA RUFA. Fr. On oak in profusion.
71. „ CONTORTA. Schw. A very immature specimen was found upon a piece of hard wood.
72. HYPOMYCES ROSELLUS. Fr. Upon *Stereum hirsutum.*
73. NECTRIA SANGUINEA. Fr.
74. „ EPISPHÆRIA. Fr. On *Valsa quaternata.*
75. XYLARIA HYPOXYLON. Grev.
76. HYPOXYLON CONCENTRICUM. Grev.
77. „ COCCINEUM. Bull.
78. EUTYPA LATA. Tul.
79. MELOGRAMMA RUBRICOSUM. Tul. On beech.
80. VALSA QUATERNATA. Fr.
81. SPHÆRIA AQUILA. Fr.
82. „ HELICOMA. N. Sp. Upon the ground where sawdust had been laid. The minute perithecia are imbedded amongst the threads of its conidia *Helicoma mulleri.*

IV.

ON THE MIGRATION OF THE STONECHAT (*Pratincola rubicola.* Linn.)

BY JOHN CORDEAUX.

Read 30th January, 1877.

I WISH to call the attention of ornithologists living on the east coast, to some peculiarities in the migration of the Stonechat as observed on our eastern seaboard.

The stonechat, although rather locally distributed, is generally common in every part of the British Isles. It may be considered

a partial migrant, some remaining throughout the winter, braving the cold even of the most severe seasons. Much the larger portion, however, of those visiting us, or bred here, invariably leave our shores in the autumn to return again in the spring.

In north-east Lincolnshire the stonechat, as a resident, is comparatively a rare bird, local, and nesting only in a few suitable localities. Rather late in the autumn, during the first fortnight in October, we frequently find them numerously scattered in our north-east marshes and along the coast; very favourite localities of this season are the low "marram" covered sand dunes on the Lincolnshire and Holderness coast; the long promontory of Spurn is also another well-known haunt, where I have found them in October in great abundance.

Their numbers at this season vary greatly year by year. In some years congregating quite thickly along our east coast, in others they are comparatively scarce. By the middle of November the stonechats have taken their departure: any we afterwards see during the winter months are an occasional bird, haunting the sheepfolds on the turnips, where they manage, along with pied wagtails and some pipits, to pick up a subsistence from various eggs and larvæ of insects concealed in the dry soil beneath the turnips. When the bulbs are drawn and pitched into heaps preparatory to cutting, these small birds search most pertinaciously amongst the heaped roots for insect remains. With these exceptions we never see anything more of the stonechat till early in the following spring, when in the last week in *February* and throughout *March** several (invariably almost singly or at the most in pairs) make their appearance; and may then generally be found in the more enclosed and sheltered parts of the district, perched on low clipped fences, the banks of drains, or turf walls near the coast. The stonechat appears to be a very early immigrant in the spring, preceding every other summer visitant.

I have always hitherto considered these autumn assemblies of the stonechat on our coast, as birds on the move southward from some more northern station; and the more scattered birds seen in the early spring, if not actual immigrants from the continent, partial migrants on the move from one district of England to another. In

* In this district in 1877 I saw the first stonechat as early as the 24th of February. (March 1st, 1877).—J. C.

the autumn I have been much struck with the persistency with which, week after week, the stonechats stick to the vicinity of the coast, gradually increasing their numbers, long after our other summer migrants have left: they, too, in their turn depart, following apparently the great stream of migrants to the south.

Further information, which I shall now briefly detail, has recently induced me to alter my views on this subject and to adopt the conclusion that the line of migration followed by the stonechats is not the common route from N. to S. followed by other birds, but rather from E. to W. across the general line of migratory flight, or, to be exact, rather from W.N.W. to E.S.E.

Facts, which Mr. Gätke, of Heligoland, has recently communicated, shew exactly identical phenomena attending the migration of the stonechat across that island, as are observed in the east coast marshes. *Pratincola rubicola* occurs regularly in Heligoland in autumn and spring; scarcely in such numbers as to be called very common; and, compared with the whinchat, which is always in great abundance at both migratory periods, may be almost termed scarce.

In the autumn they are seen during October, some in November. In the spring from about the 24th to the end of February and the first three weeks of March. Unlike the whinchat (a species having a wide northern range), which always comes in great abundance from April 1st to the end of May and even the first week in June, the stonechat does not care for fine warm weather, coming when it is often rough and clouded. Mr. Gätke says, they are the first harbingers of the returning spring, preceding the pied wagtail about a week.

The stonechat cannot be considered a northern bird in Europe, its summer quarters, except in the extreme west and east, ranging scarcely beyond the middle zone of the western Palæarctic region. Professor Newton in his new edition of "Yarrell's British Birds," (vol. i, p. 340 *et seq.*) has very accurately defined the range and distribution of the stonechat in Europe. It is very rare in Orkney; rarer still in Shetland; according to Professor Nilsson, has only once been met with in Sweden, and that in the extreme south; and Dr. Kjœrbölling says, has been only twice observed in Denmark.

Its northern limits may be defined by a curved line drawn from the north of Scotland across the North Sea, cutting the European

coast just north of Holland, and then rapidly declining south of *Oldenburgh*, through *Hanover*, *Halle*, *Dresden*, the line of the *Riesen Gebirge* and on to *Cracow;* and thence rapidly bending northward again across Russia south of *Moscow* to *Perm* in latitude 58° north, or nearly the same latitude as Duncansby Head, the north-east point of Scotland. The most southern point touched by this line would be *Dresden*, in latitude 51° 4′ north. Professor Newton says, "it seems in North Germany to be only an accidental visitor to the right of the Elbe, and there is no trace of it further to the eastward than Western Pomerania, where it has been once met with." On the Asiatic side of the Ural its range appears to extend further northward than in Europe, and Otto Finsch in his recent journey down the Ob (see "Ibis," January, 1877, p. 57) saw the last *Pratincola rubicola* near the last Russian village south of Obdorsk, where the Ob enters the gulf of that name, just south of the Arctic circle.

As it is thus shewn that in Europe the stonechat is not a northern bird migrating and breeding north of the Elbe, whence come those stonechats which appear with such regularity in the early spring and late autumn in Heligoland? and where are they bound?

From the very peculiar distribution of this species in Europe, it is plain they are not moving northward in the spring, or coming from the north in the autumn. Either then the range of *P. rubicola* extends much farther to the north-east than it is supposed to do which we scarcely think is the case as it is highly improbable so well-known a species could hitherto have been overlooked by English and continental observers, or (and we think this latter the only feasible explanation) the particular line of migration followed is one across the regular route of birds moving north and south. The facts of the case as observed in Eastern England and Heligoland, all tend to support the hypothesis of the migration of *P. rubicola* from west to east in the autumn and in the opposite direction in the spring.

Mr. Blake Knox writing from the county Dublin (Zool. 1866, p. 222), has noticed that the numbers of stonechats are augmented in the autumn. These are probably birds collecting for migration, exactly as they do on our own eastern coast. The Irish stonechats will cross to England, and along with numbers of our own birds

work their way across the country to the east coast: here they assemble in greater or less numbers according to the state of wind and weather, waiting for a favourable opportunity to cross the North Sea. It is the left wing, if I may use the expression, of the stone-chats which at this season sweeps across Heligoland, and thence in an E.S.E. direction across Europe to their winter quarters in lands surrounding the north-east shores of the Mediterranean.

In the same manner, in the spring, it is the extreme right wing which touches Heligoland on their way to the eastern shores of England and Scotland; that is, in the autumn our English birds cross directly to the coast of Holland and Belgium from Norfolk and Lincolnshire, and return in the spring by the same route.

Instances, as we could name, are not uncommon amongst birds of the Western Palæarctic regions, of a migration at variance with the usual line of migratory flight. Perhaps one of the most noticeable is that of the yellow-crowned warbler, *Phylloscopus superciliosus*. That individual, of a small and delicate willow wren, whose nesting haunts are in the warm sheltered mountain valleys of Southern Siberia, Turkestan, and Cashmere, and its winter quarters in Southern India and China, Pegu, and the islands of the Pacific, should *regularly* in the autumn appear in a distant spot of Western Europe, is confessedly one of the most puzzling anomalies of migration. From some cause or other, these small wanderers take their flight exactly in an opposite direction to the rest of their species; N.W. into the cold and gloomy north, instead of S.E. to the eternal summer of the tropics. They cross much of Asia, all Europe, and then continuing their flight over seventy miles of sea, alight for a time on a bleak red sand-stone rock, affording little or no shelter. That they should turn up in Heligoland more than in any other locality along their route is doubtless due to the very circumscribed area of the island, as well as the close look out for rare wanderers kept by the indefatigable ornithologist and his assistants living on that bleak spot.

V.

A MEMOIR OF MR. LILLY WIGG, F.L.S., OF GT. YARMOUTH.

By Hampden G. Glasspoole.

Read 27th February, 1877.

The subject of this paper was born in the village of Smallburgh, Norfolk, on Christmas Day, 1749. His father was a poor but respectable shoemaker, and brought up his son to the same trade; having first given him all the education that a village school in those days could afford.

We have no account of Wigg's early life, except that a writer who gives a short sketch of him, in the Gentleman's Magazine for February, 1830, mentions "that he was very fond of books;" and endowed by nature with more than ordinary talents, he took a dislike to his humble occupation, and before he was twenty removed to Yarmouth, where he opened a school in "Fighting-cock Row."[1] This business which was more congenial to his inclinations (but of little profit to his pocket), he continued for many years. Occupied as was his time, and small as were his resources, Mr. Wigg nevertheless by dint of great industry acquired a competent knowledge of Latin, made himself to a certain degree acquainted with Greek and French; he was also very conversant with the highest branches of arithmetic.

The parish of Smallburgh lies next the marsh grounds, on the road between Yarmouth and North Walsham; the river Ant runs through it, and is crossed by a bridge called Wafer bridge, a corruption of the Saxon "Wayfare". Whether it was here among the marshes and the broads of the district that Wigg's attachment to natural history first manifested itself is not known, but he certainly became a most ardent student of the science. Botany was his favourite department, and as long as he had health and strength few men pursued the study with more energy, or as far as his limited means would allow with more success.

Yarmouth and its neighbourhood was his great field of action

[1] See Palmer's Perlustrations of Gt. Yarmouth, vol. i, p. 178.

this he investigated with uncommon care, and made in it more than one addition to the list of British flowering plants, besides many among the Marine Algæ, to which for a considerable part of his life he paid the closest attention. One of these discovered by, and named after him *Fucus wigghii*, now know as *Naccaria wigghii*, forms, says Paget, one of the greatest gems in the herbarium.[2]

About the year 1800, the Linnean Society elected Mr. Wigg a member of its associates. Mr. Wigg became acquainted in the course of his investigations with Sir James Smith, Dr. Aikin, the Hon. J. Wenman, Mr. Woodward, men of the same pursuits; and Mr. Dawson Turner, who attributed his becoming a botanist to Mr. Wigg's influence; and in one of the papers of the Linnean Transactions, Mr. Turner mentions Wigg as his instructor and coadjutor. (Vide *Linn. Trans.*, vol. v, p. 215.)

In 1801, when Mr. Wigg must have been more than fifty years old (if the dates are correct), Mr. Turner enabled him to exchange the drudgery of a school for a clerkship in the bank of Gurney and Turner, which situation he held until the end of his life.

The following recollections about Mr. Wigg were supplied me by Mr. George Fitt, of Norwich, who was personally acquainted with Mr. Dawson Turner, and others connected with the bank at that time. "His place there was a very subordinate one, and his pay low in proportion. With all his ability, which was considerable in a certain way, he never acquired any knowledge of banking business, and evinced no desire for it." One singular example of this occurred during a "run" on the bank in a money panic; the clerks had to stay at business later than usual, and refreshments were provided on a table in a corner behind the desks, as no one was able to leave his place during the day. Wigg went on with his usual employment seemingly unmindful of the bustle, but paying particular and frequent attention to the bottled porter and sandwiches. At length he remarked to one of the clerks, "We seem very busy to-day, I never saw so many people at the counter before;" but he was certainly unaware of the cause of the bustle. He was taciturn and somewhat morose and rough in manner, unless he could be interested in some subject of natural history.

There were two persons with him in the bank, Fred. Crome, one of the sons of John Crome, the great artist; and John May,

[2] Perlustrations of Gt. Yarmouth.

who had been cashier, and was the senior clerk; both were wags and fond of fun. Crome especially, was clever, witty, full of mimicry, and fond of practical jokes. Poor Wigg from his rather odd appearance, and the habit of frequently pulling up his small clothes by the waist (as he did not wear braces), was a frequent butt of these two worthies.

Crome played him a sad trick one day, by concocting a paragraph said to be taken from a certain newspaper, about a newly found animal in South Africa, something like a small bison, and was named "*Bos Minor.*" The description was so circumstantial that Wigg took it all in, for he did not understand a joke (as Sidney Smith said of Lord John Russell, it required a surgical operation to get a joke into Wigg). When he found out the deception he was very wroth, calling Crome a fool, rascal, &c. Crome played Wigg another trick, which showed his impatient and irascible temper, which might have ended with very serious consequences. Wigg was accustomed to wear a low crowned broad brimmer; one evening Crome drove a nail through the brim and fastened it to the hat-rail; when Wigg went to put it on, it of course resisted, and giving it a snatch, off came the brim. In his fury at the destruction of his "Golgotha," Wigg rushed to the counter, and seizing a fifty sovereign brass weight, hurled it with great force at May's head. May fortunately stooped in time to avoid the blow, which left a considerable indentation in the door of an iron safe, in front of which May stood.

Notwithstanding his peculiarities of temper, Wigg is said to have been scrupulously honest in word and deed, and most singularly exact and neat in all he did. He was very particular in his method of putting down figures, which he always did from the right to the left, contending that in no other way could they be kept in columns and fit for casting up; he was always very much annoyed if any one gave him columns to cast up, where the figures were placed irregularly.

Mr. Turner told Mr. Fitt, that when he was a young botanist he received much help from Mr. Wigg, who, however, placed limits to it. Wigg had admitted to Mr. Turner, that *Pyrola rotundifolia* grew very near to Yarmouth, only a few minutes' walk indeed from the bridge; but he resolutely refused to say where. Mr. Turner was a very energetic and persevering man, and made up his mind

to find it, but he did not accomplish this the first year of trying. Afterwards he found a single specimen in a small piece of marsh on the west side of the Southtown road, near the "Marsh House;" and not knowing that it was the *last existing* specimen there, he gathered it, and showed it to Mr. Wigg the next day. Wigg stamped his foot with vexation, and said, "You got that near the old house on the marsh." "I did Mr. Wigg." "Then you have destroyed the plant here; for it was the last that remained on the Yarmouth station. I wish I had not told you of it." It was Wigg's fault: for if he had told Mr. Turner it was the last, and pointed it out to him, Mr. Turner would not have touched it.

When the races were first proposed to be held at Yarmouth, Mr. Wigg was much opposed to it, as he concluded they would destroy some of the best plants on the Yarmouth station, which grew on the South Denes. These were, *Rottbollia incurvata*, *Eryngium maritimum*, *Chenopodium botryoides*, *Trifolium striatum* (not rare), *T. scabrum*, *T. glomeratum*, *T. suffocatum*, *T. subterraneum*, *T. ornithopodioides*, and other plants less rare. However, the races were held, and the course as a necessary consequence much cut up and trampled on. Mr. Turner could not at first induce Mr. Wigg to go after the races had been held, to see what injury they had done. Some length of time after, when there had been some copious showers, he was induced to go and examine the ground; and he returned in the highest glee, rubbing his hands and exclaiming, "I was never so astonished in my life: why the races have done the plants good; and I never saw them so luxuriant as they are on the broken ground."

Mr. Turner always spoke of Wigg as a very shrewd and acute botanist, and a good finder; he also paid him a high compliment by bestowing his name on a Marine Alga (*Fucus wigghii*), as the following extract from a paper in the Linnean Transactions by Mr. Turner will show.

"A single specimen of the *Fucus* was found many years ago upon the Yarmouth beach, by Mr. Wigg, to whose merit I feel a peculiar pleasure in paying what I consider the most public testimony in my power, by making it known to the botanical world under his name; and as I think there cannot be the smallest doubt of its being totally distinct, not only from every English, but also from every other *Fucus* hitherto known; I trust, that however

uncouth the appellation I have bestowed upon it, the Linnean Society will share my feeling, and nevertheless suffer it under that title to descend to posterity." (See Linn. Trans., vol. 6, p. 136.)

It was not only on the Flora, but he also bestowed considerable attention on the birds and fish of the coast and neighbourhood. In the 15th volume of the Linnean Transactions, p. 55, it is stated, that Mr. Wigg had a specimen of the very rare red-breasted goose (*Anser ruficollis*), which was killed at Halvergate, in 1805: he bought it in the Yarmouth market, and not knowing its rarity had it plucked and cooked. This was a subject of constant regret to him, but he said the flesh was well flavoured.

In politics Mr. Wigg was a republican, in religion a Baptist; but for private reasons, he for more than thirty years of his life frequented no place of worship. The writer in the Gentleman's Magazine states, that his prejudices against the Catholics were peculiarly strong; they were what he had imbibed with his mother's milk, and what at the period of his birth were entertained by a considerable portion of the community.

As an author he never appeared before the public; but it appears it was his intention to have done so, and with this view he had for many years been collecting materials for a history of esculent plants. These MSS. under the title of "Flora Cibaria," in four volumes, and a fifth containing an index, are in the library and herbarium at Kew. They contain merely extracts about plants used as food in various countries, from books of travel, etc., which Mr. Wigg had read, and there is no original matter in any of them. In the first volume is a slight pencil sketch of Mr. Wigg, drawn from life by Mrs. Dawson Turner, in 1804, and he there looks like a man near sixty years of age.

Mr. Wigg left no collection of plants of importance, and his Marine Algæ collected at Yarmouth must have been scanty, and were possibly incorporated with Mr. Dawson Turner's collection now at Kew.

Mr. Wigg died after a few days' illness on the 28th March, 1828, at Gt. Yarmouth, in his 80th year.

It is said that he left behind him a large accumulation of valuable notes on botany and natural history; of which I cannot find any trace either at Kew or the Linnean Society, except those already mentioned, so that in all probability they are lost to the world.

The value of Mr. Wigg's labours are best understood by the frequency with which his name is mentioned by the botanical writers of his time.

List of Plants etc., discovered by Mr. Wigg *in the neighbourhood of Yarmouth, mentioned in a sketch of the Natural History of the locality, by* C. *and* J. Paget, 1834.

Berberis vulgaris—hedges, Caister, Burgh, and Lound.
Barbarea præcox—hedge by Bradwell marshes.
Malva moschata—Mautby, very rare, 1809.
Genista tinctoria—marsh, Bradwell, 1801.
Vicia lathyroides—sandy ground, Burgh Castle.
Crithmum maritimum (?)—Hemsby marrams, very rare, about 1781 (?)
Sison amomum—Caister, Gorleston, 1804.
Petroselinum segetum—hedge by Acle dam.
Fedia dentata—lane between Bradwell and Gorleston, 1816.
Inula crithmoides—a single specimen found on the Caister marrams, 1784.
Picris hieracioides—chalk hill, Blundeston, 1794.
Pyrola rotundifolia—Bradwell common.
Primula veris—Mr. Wigg used to find at Belton.
Leonurus cardiaca—waste places, Caister and Belton, 1801.
Lamium disectum—Filby and Burgh, 1802.
Asplenium ruta-muraria—walls at Caister, Hemsby church wall, 1801.
Asplenium trichomanes—old walls, Thrigby, 1801.

Algæ.

Fucus canaliculatus—once found by Mr. Wigg.
Fucus wigghii " "

Birds.

Somateria spectabilis—king eider—a female shot on Breydon, 25th July, 1813.
Clangula (Fuligula) histrionica—harlequin garrot, Mr. Wigg once bought this in the market.
Anser ruficollis—Red-breasted goose.

Fish.

Piromyeton marinus, Lamprey—Mr. Wigg had known this to be taken near Yarmouth.

VI.

NOTES ON THE ACULEATE HYMENOPTERA.

By J. B. Bridgman.

Read November 28th, 1876.

Last year in my notes I complained of the badness of the season; but what can I say of that which is just passed? It has been bad indeed for these insects, at least in this neighbourhood, and from reports which have reached me, not in this alone.

The winter was long and cold, with sharp frosts quite up to the end of March: then April came in with a week of splendid weather, more like summer than early spring. The willows and sallows were much earlier in flower this year than last. On the 2nd of April *Andrena smithella* again abounded, also the males of *A. bimaculata* and *atriceps*. At the commencement of the month I dug out about a score of the females of *A. bimaculata* on Mousehold; they appeared to be generally dispersed over the bare loamy spots, they do not burrow deeply, and generally the mouth of the burrow was at the root of a tuft of grass, and partially concealed by it. The 9th was cold, a little snow fell, and was succeeded by a week of cold and snow. On the 16th, I took a female of *A. nigro-œnea* with a male Stylops in it; this species is very rarely attacked by the parasite. I took several other bees of the same species, similarly circumstanced in the early part of the season; this is the first time I have met with *nigro-œnea* attacked by Stylops; those which appeared later in the season seemed to be free from them. On Mousehold during this month, I was fortunate enough to take the local *Andrena picicornis*. On the 25th of the same month, I captured four males of the new *Nomada* at Brundall, of which I took two females last spring; at that time I expressed fears, that as the bank I found them on had been cut away, I should get no more, fears which I am happy to say were not verified, as I took the above mentioned males, and about a week later, sixteen females: I also found three females of the same species in May, at Cringleford.

At the end of April, Mr. Bayfield kindly sent me some very

large ants, which were found in Mr. Fraser's saw-yard in St. Martin's at Palace, Norwich. These were found in some birch timber, from St. John's, New Brunswick, and have been indentified for me by Mr. F. Smith, as the true *Formica herculanea* Linné, but not that of Stephens and other English writers; this I believe is the first time they have been taken alive in England. The female of this species contrary to what takes place in our native ants, retains its wings. It would be interesting to find, that this fine species had settled itself in this country, if it did do so, it would not be the first introduced species. I believe the little yellow pest, that frequents some of the houses in London, is an American importation; Madeira has also given us another species. As a whole April was dull, cold, and wet.

Cold weather with strong N.E. winds prevailed during the next month. June also was very unfavourable on account of the want of sunshine and the coldness of the winds: during this month I took literally nothing. A change came in the middle of July, and we had some splendid weather for these insects, but unfortunately I could not spare time to go after them; though in the little time I had, I succeeded in taking some very good things. At Worstead on the 11th, I took off the flowers of *Knautia arvensis*, a male and female of our finest *Andrena*, "*hattorfiana*"; the weather was warm but dull, or I might perhaps have taken more of them. A day or two later I found three females of that handsome parasite *Nomada armata*, flying about a bank at Eaton, at nine o'clock in the morning: as this parasite is believed to confine its attacks to *Andrena hattorfiana*, and this *Andrena* frequents the flowers of *Knautia arvensis* only, I hunted about for that plant, and succeeded in finding a fine patch of it, from which I took half a dozen females of the latter bee, but could not find a male of either. I look upon these captures as very singular, for they were in a situation I had frequently hunted in past seasons, and yet I never saw a specimen of either till this year. I can hardly believe I could overlook such large and conspicuous species; if I did not, how came they there this year? One would almost think they must have been there before; but as I know the time of appearance and the locality, it remains to be seen if they can be found there next season. It is remarkable that an insect should be infested with a parasite, and that parasite extremely scarce, yet found on

both sides, and at the south of England, and that very sparingly, still always with the same *Andrena*, though the parasite I believe is not always present with the *Andrena*. It is easy to conceive how a fertile female constructive bee might stray and form a fresh colony; but I do not understand how the parasite finds its special constructive bee. This is not the only case of the kind, for *Nomada baccata* is only found with *Andrena argentata*, *N. borealis* with *A. clarkella*, and *N. sexfasciata* with *Eucera longicornis;* all these parasitic *Nomada* are far from common, and are never found but with the above mentioned sitos. At Brundall in the middle of July I took seven of the males of *Macropis labiata*, but was again unsuccessful in my search for the female, which has not yet been taken in Britain. There was a week of splendid weather after I took the males, these had evidently only just appeared and were in fine fresh condition; then came that memorable stormy Sunday, after which I did not see another specimen. I can only hope next season will be more propitious. These insects were at the flowers of *Carduus arvensis*.

Last year I remarked on the enormous quantity of female wasps that were about in the early spring—what a contrast to this year—in the spring I observed about half-a-dozen females. I have found one nest only this autumn, and I saw hardly any neuters except at that nest, and a few at the ivy blossoms in the middle of October, where the coldness of the weather had driven them from the scarceness of food. In the middle of August I found a nest of *Bombus fragrans* (which generally builds on the ground) in a bank, and though I dug about eighteen inches to two feet, I could not reach it. I took one female and fifteen workers going in or coming out: two of them I took going in, and one coming out of a nest of *Bombus subterraneus*, which was about three yards further on in the same bank; affording another proof that all the *Bombi* found in a nest, need not necessarily be of the same species.

On the August Bank Holiday, I found that pretty little autumn species of *Andrena, cetii*, at the flowers of the Scabious and secured a good series. I had previously only taken a solitary female, and that in 1872. The female of *Nomada xanthosticta* was again found at the flowers of *Carduus arvensis* in company with its male, formally known as *N. mistura:* these were taken during the latter part of July and commencement of August; the

only bee I found there likely to supply the wants of its future young, was *Andrena coitana*, which abounds in this locality (Brundall). The hot weather we had this summer, appeared to be too hot in the middle of the day for insects, except a few diptera nothing was to be seen. Mr. Smith told me one of his friends found insects at nine o'clock in the morning, when nothing was to be found in the middle of the day in consequence of the intense heat.

I captured at Brundall in July 1873, a female *Odynerus*, which was thought to be a singular variety of Spinipes; and as such it stood in my collection, till a notice appeared in the Entomologist's Monthly Magazine for last October, containing the description of an *Odynerus* new to Britain, the male of which had been discovered by Mr. Saunders. I thought the description of the female corresponded with my variety. Mr. Smith kindly compared it with that species for me, and returned it to me as a very large specimen of *melanocephala*, which is a very scarce insect, and not *reniformis*.

The genus *Pompilus* appears to be a very variable one in habits, as well as in structure. Both sexes of *P. fuscus* make their appearance towards the end of July. After a time the males disappear, the females hybernate; and in early Spring on the first fine day towards the end of March or beginning of April, they may be found actively at work making burrows, and storing them for the sustenance of their young. At this time no males are to be seen, their economy in this respect being exactly the same as that observed by Mr. Smith, of the genus *Halictus*. *P. gibbus* appears to have more than one brood in the year, as males may be taken in the spring as well as in the autumn; whilst *pectinipes*, *rufipes*, *sepicola*, *exaltatus*, and *hyalinatus*, as far as my experience goes, appear to have but one brood; some species appearing at one time some at another.

As it is seldom now that I can add fresh species of the *aculeata* to my Norfolk list, I purpose taking some of the other families of Hymenoptera, and shall be very much obliged to any Lepidopterists of the county who will kindly save for me any Ichneumons they may breed; and if they would add the name of the insect from which they were bred, the *locality* and the date, I should be still further obliged. These insects are best killed with burning sulphur, but in any way rather than with cyanide or laurel, as

either of them alter the colour of the yellows and reds of their bodies; the large ones may then be pinned. Long pins are an advantage with Ichneumons, in consequence of their long antennæ, the smaller ones may be fastened to pieces of card or stiff paper by a touch of gum, if without soiling the wings I should prefer it. It does not matter if they are on their sides, back, or breast; I can damp them and set them at leisure.

VII.

AN APPROXIMATE LIST OF THE EXTINCT MAMMALIA OF NORFOLK.

COMMUNICATED BY RANDALL JOHNSON.

Read February 27th, 1877.

THE county of Norfolk must have presented a very different appearance from what it does now, when ages ago, mammalia, at present totally extinct and only known to us by the fragmentary osseous remains which are occasionally found in the various deposits in different parts of the county, roamed through forests which covered this portion of England. It has been my endeavour to make out a list of the different species which have been clearly determined, leaving out those about which there is any doubt or uncertainty.

The task, however, is a very difficult one, and for several reasons. First and foremost, although the materials are abundant, our knowledge of the mammalian species belonging to this extinct fauna, regarded as a whole, is still in a very unsatisfactory state; notwithstanding the labours of Mr. John Gunn, Dr. Falconer, Professor Boyd Dawkins, and others, all of whom for many years have carefully studied the mammalian remains of this county.

The deposits in which these remains occur, all belong to the two last divisions of the Tertiary epoch, respectively called Pliocene and Pleistocene. The Pliocene strata are the old land surfaces overlying the chalk, and under-lying the Norwich crag, and the Norwich

crag itself. To the Pleistocene belong the forest-bed, and the various glacial and post-glacial beds which skirt the eastern coast, and are found in various parts of the county.

The total number of species included in the list is twenty-eight; but this number will in all probability be largely increased as we get a further and wider knowledge of palæontological science.

Of the twenty-eight species, five belong only to the stony bed and Norwich crag. These are as follows:—

MASTODON ARVERNENSIS

ELEPHAS MERIDIONALIS	ARVICOLA AMPHIBIUS
EQUUS PLICIDENS	ARVICOLA AGRESTIS

This meagre list of the stony bed and Norwich crag mammalia, will undoubtedly be largely added to as more attention is paid to these most important deposits.

Of the remaining species, eleven are peculiar to the forest-bed, viz.:—

RHINOCEROS ETRUSCUS	CERVUS CARNUTORUM
RHINOCEROS LEPTORHINUS	CERVUS POLIGNACUS
CERVUS SEDGWICKII	CERVUS GUNNII
CERVUS VERTICORNIS	CERVUS BOOIDES
CERVUS LATIFRONS	TROGONTHERIUM CUVIERI

PALÆOSPALAX MAGNUS

The remaining species belong either to the post-glacial deposits, or to the forest-bed and these deposits indiscriminately.

The species of mammalia enumerated above, belonging to the later divisions of the Tertiary period, are much more closely allied as might be expected to the existing species now characterizing the old world fauna, than to that of the new. We have, carnivora, elephants, rhinoceroses, and hippopotamuses, then, as now, characteristic old world forms. The ruminants again, are equally characteristic of the eastern hemisphere, though not exclusively confined to it. No law is more firmly established than that laid down by Professor Owen, viz:—"That with extinct as with existing mammalia, particular forms were restricted to the same provinces at a former geological period as they are at the present day."

In looking through this list of the various species, one cannot fail to be struck with the total disproportion of numbers between herbivora and carnivora. In a total of twenty-eight species, no less than twenty-four are herbivorous, whereas we have only three

strictly carnivorous and one insectivorous mammal. This seeming disproportion may, however, partly be accounted for; because it is a well-known fact, that the remains of carnivora are much more abundant in caves, than in deposits like the crag or forest-bed.

Co-existing with these extinct species are four forms which have survived to the present day, viz. :—

CERVUS ELAPHUS	CERVUS TARANDUS
CERVUS CAPREOLUS	URSUS ARCTOS

I have not described these in the above-mentioned list, as they are not truly extinct mammalia, although they were associated with them.

The absence in the forest-bed of a genus which we might reasonably have expected to find, is rather remarkable. So far as I have had the means of ascertaining, no remains of Suidæ have as yet been found in this deposit. The absence of Sus is very remarkable, as it is represented by a form, *Sus antiquus*, in an earlier deposit, viz., the Suffolk crag. The remains of sheep and goat also rest upon very slender evidence as having been found in the same deposit, viz., the finding of the tarsal and metatarsal bones of these animals at Hasbro', in a portion of the forest-bed, which most undoubtedly has been subjected to great disturbance. These bones may therefore have become intermixed extraneously with the true forest-bed remains.

The works to which I am chiefly indebted in compiling this paper are—Professor Owen's 'British Fossil Mammalia;' 'The Elements of Palæontology,' by the same author; Dr. Falconer's 'Palæontographical Memoirs;' Cuvier's 'Ossemens Fossiles,' quarto edition; Croizet and Jobert's 'Ossemens Fossiles du Département du Puy de Dôme;' and various papers by Professor Boyd Dawkins in the Quarterly Journals of the Geological Society.

I have included in this list species which have been dredged up at sea from the various post-glacial deposits, although not strictly within the limits of this county. At the time when these extinct mammalia existed, the distribution of land was altogether different from what it is now: dry land then extended as far as the opposite coast of Holland; in fact it has been clearly proved by the various soundings taken and other means that England was during the later Pliocene and earlier Pleistocene periods part and parcel of the continent of Europe.

Order PROBOSCIDEA.

Genus MASTODON.

Subgenus TETRALOPHODON.

M. [TETRALOPHODON] ARVERNENSIS (Falconer).—Cuvier, the founder of the genus Mastodon, in his work, 'Ossemens Fossiles,' tom. i, p. 205, gives as his reason for founding this genus, and thereby separating the Mastodons from the true elephants, that the molar teeth of Mastodon consisted of a comparatively simple crown divided into mammillæ, arranged in transverse ridges more or less numerous, and more or less prominent, with corresponding hollows between them; while the molars of the genus Elephas, were much more complex, consisting of a far greater number of transverse plates, the space between which were filled up with cement.

Dr. Falconer, one of our greatest authorities on fossil proboscidea, divided the genus Mastodon into two subgenera, viz., Trilophodon and Tetralophodon, owing to the molar teeth in either of these subgenera having a ternary or quaternary ridged formula. This ridge formula enables us to tell with unerring precision the composition of the crown of any molar tooth of Mastodon; the three intermediate molars shewing invariably the ridge-formula, while the tooth in front of these shews one ridge less and the one immediately behind shews one ridge more.

The species *Mastodon arvernensis*, is the only one, so far as I am aware, that is found in Norfolk. The old land surface over-lying the chalk and under-lying the Norwich crag is the deposit in which the remains of this mammal are found.

The localities where it has occurred are as follows :—Horstead, Thorpe, Bramerton, Postwick, and Whitlingham.

The chief characteristics of the species are, the multimammillate structure of the molars, the absence of tusks in the lower jaw, and the valleys between the ridges of the molar teeth being filled up with one or more tubercles.

The species seems to have had a considerable distribution in time, as it is also found in an older deposit than that underlying the Norwich crag, viz., the Suffolk crag; where it is associated with a fauna that shew much warmer climatal conditions than the fauna of the old land surface, where the remains have been found in this county. It is never found in the forest-bed.

Genus ELEPHAS.

Subgenus LOXODON.

E. [LOXODON] MERIDIONALIS (Nesti).—The genus Elephas is separated from the genus Mastodon for the reasons assigned above, as well as by the absence of an isomerous ridge formula to the three intermediate molars of the upper and lower jaws. And because the ridges in the molar teeth, instead of being limited to three or four, range from six up to an unlimited number, in the different groups of species, Dr. Falconer has, as in the case of the Mastodons, upon these grounds, again split up the genus Elephas into three subgenera, founded upon the ridge formula of the molars and certain other dental characters.

These three subgenera of Elephas are respectively named, Stegodon, Loxodon, and Euelephas.

The subgenus Loxodon is characterized by the plates of the molar teeth presenting a succession of wedge-shaped elongated processes, with a thinner coating of enamel than the plates of the molars in the subgenus Stegodon; neither are the plates so numerous as in the subgenus Euelephas.

Elephas meridionalis occurs both in the old land surface underlying the crag, as well as in the forest-bed. This species had a greater distribution in time than Mastodon arvernensis, remains of it being found in the Suffolk crag, the stony bed, and forest-bed. The remains of Mastodon never occur in the forest-bed.

Subgenus EUELEPHAS.

E. [EUELEPHAS] ANTIQUUS (Falconer).—In the subgenus Euelephas the ridges of the molars are compressed and closely packed together, with an attenuation of the ivory enamel and cement which forms the tooth; but as there is a limit to the lateral expansion of the crown, the ridges are attenuated and elongated vertically.

The chief characteristics of the species *Elephas antiquus* are as follows:—the crowns of the molar teeth are very narrow, hence it is often called the Narrow-toothed Elephant. The enamel of the plates of the teeth are very much crimped, and the plates themselves show a certain amount of mesial rhomboidal expansion of the discs of wear.

The deposits in which this species is found, are the forest-bed

(from my own experience principally from the upper portion), and the post-glacial deposits underlying the sea along our eastern coast.

E. [EUELEPHAS] PRIMIGENIUS (Cuvier).—This species which is commonly called the mammoth was first specifically determined by Cuvier; and in fact, nearly all the fossil remains of Elephas were at first attributed to this species, until Dr. Falconer's remarkable discoveries in the Sivalik Hills in India. The distinctive characters of this species may be expressed as follows:—the great narrowness or compression and approximation of the crown ridges in the molar teeth, involving the largest number of plates known in the same length of crown. The tenuity of and absence of crimping in the enamel plates. The greater width of the molar crowns than of any other species in the same subgenus, and the strongly marked curvature of the tusks.

This species had a very wide geographical range. Its remains have been found in North America, Arctic Siberia, the Russian Steppes, Germany, France, England, and central Italy.

The deposits in which it has been found in Norfolk are, the various post-glacial deposits spread over the county and under-lying the German Ocean. This species never occurs in the forest-bed.

Order UNGULATA.

Family RHINOCERATIDÆ.

Genus RHINOCEROS.

R. TICHORHINUS (Fischer and Cuvier).—The chief point by which the four species of rhinoceroses which lived in Pliocene and Post-Pliocene times, were specifically determined, was the existence or non-existence of the nasal septum, that is, whether the nasal apertures were divided or not by a plate of bone. *Rhinoceros tichorhinus* had a complete bony nasal septum, as the name expresses. The species was a two-horned one, and fully as large as the existing Indian species. The enamel which is one of the elements of the molar teeth, is very thick and more rugose than in other species of the same family.

This species is only found in Norfolk in Pleistocene deposits, and is strictly post-glacial. The skull in the celebrated collection formed by the late Mr. Owles, of Yarmouth, and now deposited

in the British Museum, belongs to this species. *Rhinoceros tichorhinus*, is synonymous with the *Rhinoceros antiquitatis* of Blumenbach.

R. ETRUSCUS (Falconer).—*Rhinoceros etruscus* differs from the above-mentioned *Rhinoceros tichorhinus*, in having an incomplete nasal septum. The animal had a comparatively slight and slender form when compared with *R. tichorhinus*. It possessed two horns. The enamel is much smoother and much thinner, than in the molars of *R. tichorhinus*.

This species is abundant in the forest-bed, which is the only deposit in this county in which it has been found. It is also found in the Pliocene deposits of southern France and of the Val d'Arno in Italy.

R. LEPTORHINUS (Cuvier).—This species is the original and typical *Rhinoceros leptorhinus* of Cuvier, and is synonymous with the *Rhinoceros megarhinus* of Christol. It is the only Pliocene or Post-Pliocene species that had not a nasal septum. The form of the skull is very narrow as when compared with *Rhinoceros etruscus*; it agrees with *R. etruscus* in the enamel of the teeth not being rugose or so thick as in *R. tichorhinus*. The remains of this animal have been found in the forest-bed, where, however, they are not so numerous as those of *R. etruscus*.

Genus EQUUS.

EQUUS PLICIDENS (Owen).—If we compare the fossil molars of Equus with those of the recent species, we find the enamel ridges to be far more plaited in the former. The transverse diameter of the molar teeth is considerably less than in the recent species of similar size. *Equus plicidens* in this respect resembles very much its ancestor *Hipparion*. The species is found in the old land surface under-lying the crag in the forest-bed, and dredged up off the Norfolk coast from post-glacial deposits.

Genus HIPPOPOTAMUS.

Subgenus TETRAPROTODON.

H. MAJOR (Owen).—The genus Hippopotamus comprises two subgenera, Hexaprotodon and Tetraprotodon; so named on account of the number of the incisor teeth being in the former case six, and in the latter four, above and below.

To the subgenus Tetraprotodon, *Hippopotamus major* belongs: it is the most divergent form in the subgenus. The chief characteristics of the species are:—the shortness of the cranium, the possession of posterior orbits, the great elevation of the sagittal and occipital crests, and the excessive elongation of the upper margin of the orbits above the plane of the brow.

Hippopotamus major is found in the forest-bed; and curiously enough the remains of this animal that have come under my own notice, are nearly all of them marked Cromer: so the species seems to have been limited to a particular place in this deposit.

The occurrence of Hippopotamus in the crag is extremely doubtful. I have seen a piece of ivory from the crag with exactly the same texture as the ivory of Hippopotamus: this is, so far as I am aware, the only evidence of its occurrence in the crag.

Section RUMINANTIA.

Genus BISON.

Bison priscus (Bojanus).—In the section Ruminantia, the chief characteristics are:—the stomach being so formed as to allow of a second mastication of the food, hence the name of the section; the presence of incisors in the lower jaw only; the molars, almost always six on each side of both jaws, have their crown marked by two double crescents, with the convexity turned inwards in the upper set, and outwards in the lower; the presence of two toes and two hoofs, flattened at the contiguous sides, so as to resemble a single hoof cloven.

Owen in his 'Brit. Foss. Mamm. and Birds,' quoting from Cuvier's 'Menagerie du Muséum d'Histoire Naturelle,' mentions the chief characteristics of *Bison priscus* as follows:—

"The forehead of the ox is flat and even slightly concave; that of bison is convex; it is quadrate in the ox, its height, taking the base between the orbits, being equal to its breadth; in the bison, measured at the same place, the breadth greatly exceeds the height in the proportion of three to two. The horns are attached in the ox to the extremity of the highest salient line in the head, that which separates the forehead from the occiput; in the bison this line is two inches below the root of the horns: the plane of the occiput forms an acute angle with the forehead in the ox; the

angle is obtuse in the bison; finally that plane of the occiput is quadrangular in the ox but semi-circular in the bison."

Remains of the species are found in the forest-bed, and dredged from the post-glacial deposits on the coasts.

This species seems to have been the direct ancestor of the Lithuanian aurochs now strictly preserved in the forests of Lithuania.

Genus BOS.

B. PRIMIGENIUS (Bojanus).—*Bos primigenius* differs from the *Bison priscus* for the reasons mentioned above, as well as by the greater length of its horns. It seems to have been equal in size if not even superior to *Bison priscus*. It seems to have existed down to the historical period, as it is mentioned under the name of *Urus* by Cæsar, as existing in his day in the great Hercynian forest. It is also mentioned in an old German ballad of the twelfth century as having been slain with other animals, in a great hunt which took place in the forest of Worms.

The fine skulls and horn cores in the Norwich Museum, were obtained from the peat in cutting the North Walsham and Dilham canal.

B. LONGIFRONS (Owen).—This species differs from *Bos primigenius* in its great inferiority of size. The horn cores are also much smaller and shorter, as well as differently directed; the forehead is less concave, in fact nearly flat; the frontal bones extend further beyond the orbits before they join the nasals.

Professor Bell in his 'British Quadrupeds,' page 414, seems to think that, *Bos primigenius* was the probable ancestor of our present domestic ox. It seems, however, more reasonable to suppose that *Bos longifrons* was the ancestor, for this reason: *Bos longifrons* is known to have been domesticated. It is found associated with the works of man in the Neolithic interments, as well as the later Romano-British burial grounds. The associated mammalia are the pig, goat, dog, which were no doubt kept in a state of domestication by the early races of man that inhabited western Europe.

This species is found in the alluvial deposits in Norfolk, and, in fact, often on the present surface of the land.

Family CERVIDÆ.

Genus CERVUS.

Subgenus MEGACEROS Owen.

C. [MEGACEROS] HIBERNICUS (Owen).—This species seems to have had some of the characters of the elk, the reindeer, and the fallow deer, combined with others peculiar to itself. It differed from the existing elk, to which however it is closely allied, by its immense size, and the possession of a brow antler which is not present in *Cervus alces*. From *Cervus dama*, or the fallow deer, it also differed, because in the fallow deer all the branches above the bez-antler are sent off from the posterior margin and end of the palm, while in Megaceros they are all with one exception sent off from the anterior and terminal margin.

The species is found in the forest-bed, and dredged from post-glacial deposits along the coast.

Subgenus ENCLADOCEROS Falconer.

C. [ENCLADOCEROS] SEDGWICKII (Gunn).—Dr. Falconer who founded this subgenus, says in his 'Palæontographical Memoirs,' vol. ii, p. 473, the chief characteristics are as follows:—"Horns pedunculate without brow or bez-antlers; beam and compound antlers compressed, the latter thrown off forwards and terminating without palmation in long tynes."

Of the species *Cervus sedgwickii*, he goes on to say, "Horns very ample, indicating a large species. Bar prominent without obliquity. Beam cylindrical and straight at the base, compressed upwards, giving from its anterior margin three sub-equidistant antlers which, from the summit downwards, are successively bi-, tri-, and quadri-furcate. Tynes long, straight, and conical, diverging in the same vertical plane. A single elongated tyne or fork(?) terminating the beam."

In a letter I received from Professor Boyd Dawkins, he informs me that *Cervus sedgwickii* is undoubtedly the same as the *Cervus martialis* of Gervais. *Cervus martialis* possessed sub-compressed ramified antlers, slightly expanding at the base of the terminal divisions; the brow tyne was also absent. In this respect *Cervus martialis* agrees very closely with *Cervus sedgwickii;* and from the different remains of *Cervus martialis* which have come under my

notice, I am inclined to think that the *Cervus sedgwickii* of Gunn and the *Cervus martialis* of Gervais are identical.

The deposit in which this interesting form of deer occurs, is the forest-bed. The fine antler in the Norwich Museum having been obtained from the gravel pan of the forest-bed at Bacton.

C. [MEGACEROS] LATIFRONS (Johnson).—In the 'Annals and Magazine of Natural History' for January, 1874, I described a new species of fossil deer under the name *Cervus latifrons*. The species in question belongs to the large subgenus of palmated deer, of which *Cervus megaceros* is a well-known example. It is characterized by the great breadth of the frontal bone, the extreme shortness of the pedicle (if a pedicle can really be said to exist at all), the absence of a brow antler, the beam of the antler being given off from the frontal bone nearly at right angles, with a slight curvature downwards; while at about the distance of twelve inches from the burr palmation commences, and a huge tyne is given off from the anterior surface of the beam, which curves round so as to form almost a semicircle. This species occurs in the forest-bed.

C. VERTICORNIS (Dawkins).—From a right antler in the Jermyn Street Museum, Professor Boyd Dawkins has described this species. Dr. Falconer has described the same species under the name *C. strongyloceros*.

The chief characteristics are as follows:—the brow antler is given off about two inches above the burr, and is curved abruptly downwards and outwards like a huge hook. The beam above is quite *térete* but oval, and gives off from the anterior outside a second large antler, at about from six to seven inches from the burr. The species appears to indicate a huge deer as large as the Irish elk, but quite distinct.

The habitat of this species was the forest-bed.

C. [MEGACEROS] CARNUTORUM (Dawkins).—In the Quarterly Journal of the Geological Society, for Nov. 1st, 1872, p. 409, Professor Boyd Dawkins has described this species. The brow antler rises at about two inches from the burr. The beam is deeply channelled and cylindrical. The skull differs from the true Irish elk in the interval between the bases of the antlers being smaller. The specimen from which the species was described is in the Norwich Museum, and comes from the forest-bed.

C. POLIGNACUS (Gunn).—The Abbé Croizet and M. Jobert

in a work entitled 'Recherches sur les Ossemens Fossiles du Département du Puy de Dôme,' publishes the figure of an antler which agrees exactly with a specimen in the Norwich Museum. The species to which this antler belonged, Mr. Gunn has named *Cervus polignacus*. The fragment named above is a shed antler, throwing off from the beam a brow antler, which nearly continues the beam downwards: the beam itself is deeply channelled; round below, and flattened a little above.

The fragment upon which the species is founded comes from the forest-bed.

C. GUNNII (Dawkins).—A fragment of an antler, belonging to a large palmated deer, in the Jermyn Street Museum, is labelled *Cervus gunnii*, but so far as I am aware has not been described. The specimen comes from the collection of the Rev. S. W. King, and was obtained from the forest-bed.

C. BOOIDES (Gunn).—In the Norwich Museum is a very remarkable fragment of an antler, to which Mr. Gunn has given the name *Cervus booides*, on account of its great resemblance to the horn cores of Bos. It has all the true characteristics of a cervine antler, but is given off from the skull exactly similar to the horn cores of Bos or Bison. This specimen comes from the gravel pan of the forest-bed.

Order CARNIVORA.

Section PLANTIGRADA.

Genus URSUS.

U. SPELÆUS (Blumenbach).—The chief characteristics of this species are as follows:—the long edentulous interval between the canine tooth and the first of the series of four molars; the complicated crown of the first and smallest of the molars; and the superior breadth of the fourth molar, when compared with that of the common and grizzly bears. The enormous size of the animal, it being larger than the *Ursus ferox*, or grizzly bear of North America, is another point. In this species no false molars are present in the upper jaw. The zygomatic arch of the skull is also broader and shorter, comparatively, than in *Ursus arctos* or *Ursus priscus*.

Specimens of the bones and teeth of this species have been

found in the forest-bed, and also dredged from the post-glacial deposits.

U. PRISCUS (Goldfuss).—*Ursus priscus* was a smaller species than *Ursus spelæus*. The chief difference between *Ursus priscus* and *Ursus spelæus*, is the presence of two false molars in the upper jaw of *Ursus priscus*, which are entirely wanting in *Ursus spelæus*.

The species is found in the forest-bed.

Genus FELIS.

MACHAIRODUS LATIDENS (Kaup).—This species is one of the most remarkable fossil forms of Carnivora that has yet been discovered in Pleistocene deposits. It takes its name from the long, curved, compressed canines which armed the upper jaw. The edges of these canine teeth were finely serrated, and more resemble the teeth of the extinct reptile Megalosaurus than any known carnivorous mammal. The shape of the skull best accords with that of the panther, than any other existing Carnivore.

The only Norfolk specimen that I have seen is in the collection of Mr. Jarvis, of Cromer. The specimen is a canine tooth, and was picked up on the beach at Cromer. It is probably from the forest-bed.

Order RODENTIA.

Genus TROGONTHERIUM Fischer.

TROGONTHERIUM CUVIERI (Fischer).—This species, which exceeded in size the largest specimens of the European beaver known, differs from *Castor europæus* in the following points.

The last molar in the upper jaw is longer, instead of being shorter, than the other molars, as is the case in *Castor europæus*. The antero-posterior and transverse diameters of the first molar exceed by one-third those of the second; the second and third molars are smaller in proportion to the incisor, than in Castor.

Trogontherium cuvieri is frequent in the forest-bed.

Genus ARVICOLA.

ARVICOLA AMPHIBIUS (Owen).—This fossil species of water-rat differs from the existing species, principally from the fact that the bones are a little smaller in the fossil species; the jaws and teeth agree in size as well as in other characters.

Numerous remains of this species are found in the Norwich crag and also in the forest-bed.

ARVICOLA AGRESTIS (Fleming).—The teeth of *Arvicola agrestis* may be easily recognised from those of *A. amphibius*, by the fact that the second molar in *A. agrestis* has five cemental spaces instead of four, as in *A. amphibius*. The third upper molar shews a minute supplementary angle on the outside.

The species is found, together with *A. amphibius*, in the Norwich crag and forest-bed.

Order INSECTIVORA.

Genus PALÆOSPALAX.

P. MAGNUS (Owen).—Professor Owen, from a lower jaw of an insectivorous mammal, found in the forest-bed, has founded the genus Palæospalax. This animal was a water-mole, and exceeded the common mole in size as much as Trogontherium did the European beaver. It differs from the common mole, not only in its larger size, but also in the fact that there is between the two principal cusps of each molar tooth a small tubercle, of which there is no trace in recent insectivora.

Two specimens of lower jaws have been found in the forest-bed. One is in the British Museum, and the other in the collection of Mr. Savin, of Cromer.

VIII.

MEMOIR OF THE LATE REV. RICHARD LUBBOCK.

By HENRY STEVENSON, F.L.S.

Read 27th Feb., 1877.

MANY authors have acquired an established reputation not merely by the excellence but by the multiplicity of their published works, whilst others have attained a not less imperishable fame by one effort of genius—a single contribution to some particular class of literature, with which, for all time, they are personally identified; and in this sense it would be as impossible to disconnect the name

of Gilbert White from the 'Natural History of Selborne,' as that of Richard Lubbock from the 'Fauna of Norfolk.'

The subject of this memoir, born in 1798, was the eldest and last survivor of the eight children of Richard Lubbock, M.D., an eminent physician in Norwich, and shortly after his father's death, in 1808, he was sent, under the advice of Dr. Parr—who had resigned the mastership of the Norwich Grammar School some few years before —to a school at Chiswick, where Dr. Horne was then head-master. Intended for the Church, his education was subsequently continued under a private tutor before entering upon a University career, and having passed through the usual course as a graduate of Pembroke Hall, Cambridge, he took his B.A. degree in 1824, and that of M.A. in the following year, when he was also ordained.

His taste for natural history appears to have been very early developed, and as a lad he was always welcomed by his uncle, the late Mr. J. Postle, of Colney Hall, who, was accustomed to say, whenever Lubbock walked over, gun and rod in hand, from his mother's residence at Norwich, "now the larder will be well filled." Mr. Postle also possessed a good collection of stuffed birds and other objects of natural history which had an attraction for the young ornithologist, and to which no doubt he contributed from time to time, the river and low-lying meadows at Colney being noted in those days for snipe and wildfowl, and the stream itself was formerly known as "the Swan River," from the frequent appearance there of wild swans in hard winters.

Soon after ordination Mr. Lubbock obtained a curacy at Downham, on the western side of the county, which afforded opportunities for studying the fauna of the "Fen district," at a time when its main features had been but little altered by drainage and cultivation; and the shores of the Wash, some twelve miles north of Downham, gave facilities, as well, for acquiring a knowledge of the habits of the numerous shore birds which then, resident as well as migratory, frequented the sandy flats and mussel-scalps of that portion of the coast. Three other curacies held by him, after leaving Downham, were all situated within a few miles of Norwich, and, in point of locality, were equally fortunate as regarded his tastes and out-door pursuits. Whether by accident, therefore, or choice, the villages of Hellington, Rockland, and Bramerton, became successively the scenes of his clerical duties, it is evident

that, under all circumstances, his "lines had fallen in pleasant places." At Rockland and Bramerton especially, the close vicinity of the two chief broads on the Yare commenced that intimate acquaintance with the feathered denizens of our broads and marshes which forms by far the most important feature in the ornithological portion of his work. His experience, however, as a naturalist and sportsman was by no means confined to his own county, as from notes in his interleaved copy of Bewick's 'British Birds,' as well as in the 'Fauna,' we have evidence, between the years 1823 and 1837, of holidays spent in shooting and fishing, in Wales and the Highlands of Scotland, with occasional excursions on the continent, chiefly for fly fishing, in Normandy, Switzerland, and Northern Italy. Simultaneously with his obtaining the curacy at Bramerton, in 1835, Mr. Lubbock married a daughter of the late William Unthank, Esq., of Heigham, and continued to reside there, in a pretty cottage overlooking the river, then the property of Captain Alexander, until, in 1837, he was presented to the rectory of Eccles, near Attleborough, by his brother-in-law, Sir Thomas B. Beevor, Bart., whose friendship he had made when fellow students under the same private tutor. Indeed it was by no means in the matter of residence only that he was fortunate in his earlier days, but also in that friendly intercourse with congenial spirits, which opened up for him a wide field of observation in other parts of the county, and accounts for his familiarity with almost every Broad on the Bure and its tributaries, the "mud-flats" of Breydon, and the Decoys, then plentiful enough on the coast and inland waters in the neighbourhood of Yarmouth. Thus, even when located at a distance from his former haunts, either by invitation or by hiring the right of fishing and shooting for a season over some broad and its surroundings, his leisure was devoted to his favourite pursuits, and his acquaintance kept up with that wild district. With the fenmen of those days—a race, at least as Lubbock knew them, fast becoming extinct, under the same influences as have changed the physical condition of the soil and rendered the fowler's art of little effect—he was always popular, being kind and generous in disposition, and there were few birds of any rarity that fell to their guns but came in some way under his personal inspection. Nor was he less considerate to his constant attendants and favourites of the canine race, for

whom, with broadmen and keepers, he always advocated the system of training by kindness and encouragement, with firmness, rather than the whip. He was a successful fisherman owing to his intimate acquaintance with the habits of the fish of our broads and rivers, and a good shot in days when the sportsman found his game and killed it afterwards, and did not merely in the modern sense of the term, go out to shoot! Of other traits of character, such as have come to my knowledge, though necessarily resting on the "hearsay" of others, have redounded greatly to his credit for pluck and endurance; and whilst the boys of Dr. Horne's school acquired, in his day, the sobriquet of the "Chiswick bulldogs," at a time when boys fought their way up in school in other than a mere literary sense, his prowess in this respect was ever directed to the championship of the weak against the strong.

His personal appreciation of, and sense of indebtedness to early friendships—and to those commencing still later in life—is pleasantly shown in his writings, the names of certain naturalists and sportsmen occurring repeatedly in the 'Fauna,' as authorities; prominent amongst them being the late Mr. C. S. Girdlestone,* of Yarmouth; the Bakers, of Rollesby; and Mr. John Kerrison, of Ranworth, the latter, so highly spoken of in the preface to his work, for his practical acquaintance with the management of a Decoy. Of Mr. Girdlestone's abilities as an observant naturalist, he evidently entertained a very high opinion, and amongst the MSS. notes, before referred to, is one in which he alludes to a week's cruise on the Bure in his friend Girdlestone's boat, as "a period I shall always look back upon with pleasure." It was just such a reminiscence of past days that no doubt inspired the following passage in his 'Fauna:'—

"A few years back, nothing was pleasanter than a summer expedition for a few days, to some of the larger broads; the preparing the pleasure boat, the providing shooting and fishing apparatus, the voyage and the arrival, had all their separate charms; then when arrived, the foraging for the public good; proud was the lucky wight who returned with perch or eels—prouder still he who could boast of flappers or a curlew. Then the amusement of cooking—each thinking himself the Ude of the party—and, above all, the appetite, completely superseding the French sauce, the inventor of which declared, 'Avec cela on pouvoit manger son grand père.'"

* Mr. Girdlestone was a friend and correspondent of Selby, as well as of the celebrated Colonel Hawker, on sporting and natural history topics.

With the late Mr. Lombe, of Melton, near Norwich, he was in frequent communication when that gentleman was forming the fine collection of British Birds, which now bears his name in the Norwich Museum, and he was naturally much interested in 1827, by an announcement from Mr. Lombe, that he had procured in the previous winter a new species of Swan, subsequently named after Bewick by Mr. Yarrell. Copious extracts were made at the time in his note book from Yarrell's paper on this same species, published in the Linnean Society's 'Transactions' in 1830, but his correspondence with that distinguished naturalist does not appear to have commenced till 1835, although it is by no means improbable that they had become acquainted before that time since Yarrell's visits to Yarmouth and its neighbourhood, for snipe shooting in spring and autumn, date back, at least, to the year 1829.* Be this as it may, in the first edition of his 'British Fishes,' published in 1836, Yarrell expresses his thanks to Lubbock for a communication respecting the White Bream, with specimens procured in Norfolk, and in the first edition of his 'British Birds,' of which the first number was issued in 1837, there is evidence, as well as in Lubbock's private notes of the same date, of a friendly interchange of ornithological facts. Amongst other expressions of obligation to Mr. Lubbock, Yarrell specially refers in his history of the common wild duck (vol. iii, p. 171), to his having supplied him with the particulars as to the formation of a Decoy. This description was evidently written specially for Yarrell's use, as the part containing it in the first edition was published in 1842, and in a foot-note to the second edition of the same work, in which the above account is repeated, Yarrell alludes to the more elaborate chapter on Decoys in Lubbock's 'Fauna' of 1845,† as "the best description of the mode of forming a Decoy, and the manner of working it, that I am acquainted with," an opinion still more recently endorsed by Folkard, in his well known

* See a letter on British Snipes, signed H. V. D., in the second volume of Loudon's 'Mag. Nat. Hist.,' p. 143, which, as stated in 'Thompson's Birds of Ireland' (vol. ii, p. 270, *note*), was written by Yarrell.

† Yarrell's copy of the 'Fauna,' which, at the sale of his library and collections in 1856, passed into the hands of Sir Wm. Jardine, is now in the possession of the writer of this memoir, and bears the autographs of its two r owners.

work on 'Ancient and Modern Wild Fowling,' in which, after exposing the gross ignorance exhibited by many authors of the real working of Decoys, he classes Lubbock's description with that of Blome and of Pennant, as the only reliable authorities, and describes it also as "much fuller than that of any previous writer upon the subject."

Mr. Lubbock, however, was not merely an out-door naturalist, but as a good classical scholar, and an extensive reader of English and foreign literature bearing upon his favourite study, was enabled to turn his personal experience to a thoroughly practical purpose in the endeavour to inspire others with the same elevating tastes. That the study of natural history as an important branch of science and not the amusement only of a leisure hour seems early to have impressed his mind, is shown by his connection with the Norwich Museum, as far back as 1831, when, at its seventh annual meeting, he was elected a member of the committee, his parochial duties within a few miles of the city enabling him then, for the first time, to attend its meetings. In 1839 he was also appointed one of the hon. curators of vertebrate animals to assist the salaried curator in the arrangement and classification of the specimens contributed to that department.

A series of conversaziones inaugurated by the Museum Committee in 1835, with a view to popularise that institution, introduced Mr. Lubbock to a Norwich audience as a lecturer, and from that time till the year 1845, the published reports of the committee and of the proceedings at the annual meetings bear testimony to the important services rendered by him to the Museum in that capacity; sharing the thanks of the subscribers in this respect with the well-known names of the late Professors Sedgwick and Lindley, Thomas Brightwell, Wm. Stark, and the Revs. J. Crompton and Richard Hart, the sole survivors. The committee's reports, of course, furnish only the titles of the lectures which he thus delivered, from time to time, but these appear to have been as follows:—In 1835, an Introductory paper "On the advantages of the study of Natural History, with observations on the effect of civilization as regards the increase and decrease, etc., of mankind and other animals." In 1836, "On some observations on the Ornithology of Norfolk." In 1840, "On some of the changes which have taken place in the Zoology of Britain since its occupa-

tion by the Romans," and in the following circular issued to the subscribers in November, 1843, two lectures are announced to be given by Mr. Lubbock in the ensuing year, "On the vertebrated animals of Norfolk."

"The members will learn with much pleasure that a series of lectures, having a peculiar local interest from their being dedicated to the illustration of the Geology, Flora, Fauna, and Antiquities of Norfolk, will be delivered during the ensuing season. The institution will be indebted for these to Professor Sedgwick, R. J. Mann, and Thomas Brightwell, Esqs., and the Revs. R. Lubbock and R. Hart."

These were evidently the last which he prepared with the laudable object of exciting an interest in the natural history collections of the Museum, and, as we gather from the preface to his 'Fauna,' published in the following year (1845), formed the foundation of that work. It is somewhat singular, however, that the Museum records make no reference to a lecture preserved amongst his other MSS. on a subject somewhat apart from his usual topics, although a vein of natural history runs through many of its interesting pages. The subject of this paper, for it bears no written title, may be described as observations on the conquest of America and the Aboriginal inhabitants, with special reference to the southern portions of the New World, Mexico, and the ruined cities of Central America. The date at which this lecture was delivered would probably be between 1841 and 1843, from the fact of his alluding, in the earlier portion, to Mr. Catlin's "recent work" on North America (published in 1841), the exhaustive character of which had induced him to confine his remarks to the more southern portions of that great continent. The paper is ably written, and evinces a very considerable amount of archæological as well as historical research, in a branch of literature which, apart from natural history associations, had always attractions for him—travel and exploration.

His connection with the Norwich Museum naturally led to an intimacy with other local naturalists, both of the field and the closet, including the Presidents of those days, Professor Sedgwick, Thomas Brightwell, Dawson Turner, Sir J. P. Boileau, Bart., Captain Glasspoole, Rev. W. Kirby, and his valued friend and Diocesan, the late Bishop Stanley. The annual dinner too of the members, under the chairmanship of the President of the year

a good old custom, apparently discontinued about the same time as the conversaziones and lectures), was conducive to an interchange of ideas with men of kindred tastes. It was at these reunions he became acquainted with the late Mr. J. D. Salmon, whose valuable botanical, and a portion of his oological collection were bequeathed to the Museum. His fellow worker also, in those days, in the Natural History Department, Mr. John Henry Gurney, the now permanent President of the institution, receives in his preface the warm thanks of the author of the 'Fauna,' for contributions on the subject of Norfolk ornithology.

From the above sketch, then, of a life not otherwise eventful or noteworthy in the 'Transactions' of this society, except in connection with the 'Fauna of Norfolk,' it is not difficult to trace the secret of the success of that very unpretentious volume, now many years out of print, which attained at once, and still retains amongst naturalists, at home and abroad, the position of a standard work. There is scarcely a writer, since 1845, on the birds of the United Kingdom that does not quote Lubbock, and in ornithological works comprehending a far wider geographical range his name as surely finds an honoured place in reference to the habits of wildfowl and species extinct only in the last half century in the marshes of Norfolk. His classical attainments lent that charm to his writings which only an acquaintance with ancient as well as modern literature can afford, and the happy combination, in his case, of the well-read naturalist with the practical experience of the sportsman, gave the stamp of truth to his graphic descriptions. These, too, indisputable as to their facts, will in years to come have an even greater importance: as the faithful records of those physical changes and their effects on the avi-fauna of our heaths and marshes, which, commencing in his earlier days, fulfilled, ere the close of his long life in 1876, not a few of his prognostications in 1845.

Of the works of earlier writers on the Fauna of this county, few, if any, seem to have escaped his notice, including Sir Thomas Browne's notes and the "items" bearing upon natural history subjects, in the Northumberland 'Household Book,' and the somewhat similar 'Accounts' of the L'Estranges of Hunstanton; but though commencing only with Bewick as his chief authority, he seems to have acquired with avidity the widely extended information contained in the later publications of Selby, Jardine,

Eyton, Gould, Yarrell, Hewitson, and others, as well as of many continental and contemporary authors. It should here be mentioned, inasmuch as the reputation of his book, is chiefly founded on its ornithological portion, that his 'Fauna' includes remarks on the quadrupeds (including extinct mammalia) and river fish, as well as the birds of Norfolk, and in both the former divisions of his subject Mr. Lubbock evinces an amount of practical knowledge and research, which has been fully recognised in the recent papers contributed to this society by Mr. Southwell and Dr. Lowe. His chapters on "river fish and angling" are full of interest, combining as they do his continental and home experience, with rod and line; and his remarks upon the importance of preserving the fish of our rivers, not merely for sport, but as an important article of diet, owing to the increasing cost of other kinds of provisions, should have even greater weight now with our local authorities than they had some thirty years ago—before the Yare below Norwich had become the main sewer of the city, and an Act of Parliament was rendered necessary to prevent the depopulation of our broads, dykes, and rivers, by a wholesale system of netting. The bulk of the small fry thus taken serving no higher purpose than that of manure. His observations, also, on the indifference manifested by the poorer classes in this country to many of our river fish, through ignorance of the best means of cooking them—in which the Normandy peasants excel—are as worthy of attention now as in days gone by.

The importation into our broads of fish, valuable for their size and flavour, from continental rivers, was likewise a favourite theme with Mr. Lubbock, which he urged with some force in one of his Museum lectures, but whilst he speaks of the increase of trout in some of our streams, and the introduction of *Salmo fontinalis*, is an accomplished fact within the last few years, still, denuded as our main rivers have been by the unchecked depredations of poachers, we can dispense, for some years to come, with the acclimatisation of such fishes of prey as *Silurus glanis*, and the pike-perch, to keep down, as he terms it, the "superabundance of our coarser kinds of fish, particularly bream." Indeed, his concluding words on this subject have been only too prophetic, "the lapse of a few years may so change the scene that what is now spoken of may exist no longer."

In the ornithological part of his work, which occupies by far the larger portion of the volume, and on which the author's fame has been chiefly established, only the rarer species amongst the so-called "land birds" are treated of, but his notes on the various Raptorial species, resident or migratory, to be met with in Norfolk, are well worth reading, more especially as to the harriers, now all but extinct in our marshy districts. His warnings as to the senseless persecution of the hawk tribe in general for the preservation of game, apply still more forcibly at the present day, for he points to the enormous increase of ground vermin, in rats and mice, as the nemesis of the wholesale destruction of their natural enemies—owls, kestrels, weasels, and stoats. His threnody over the fate of the nobler falcons, was also aroused by his deep interest in all that related to hawks and hawking, and, as he happily puts it, the very sight of one now-a-days is "like that of the rusty mail or the monument of a departed hero, for the memories of the past crowd upon the mind when these birds, now proscribed and almost annihilated amongst us, were the favourites of ladies and the companions of princes."

His carefully written chapter "On the remains of falconry in Norfolk," is one of the most interesting in the whole volume, and evinces the many sources, both ancient and modern, from whence his information was derived; whilst the time and pains devoted to the subject is shown by voluminous extracts amongst his MSS. from works as scarce and difficult of access as 'La Fauconnerie de Jean de Franchières, grand prieur d'Aquitaine' (Paris, 1585). Though not himself a falconer, he had many opportunities of witnessing both heron and rook hawking in his earlier days, when the late Lord Berners (Colonel Wilson) had a hawking establishment at Didlington, and Mr. Downes kept hawks in the neighbourhood of Yarmouth, and amongst the latest entries in his interleaved 'Bewick,' are notes of a visit in December, 1853, to the late Mr. C. E. Newcome, of Feltwell, whose trained peregrines showed him excellent sport at rooks, and to whose thorough knowledge of the art, as revived during the present century, he gives credit, where indeed credit was due, by claiming for him the distinction of being "the most practical falconer of his day."

The Bustard, although a bird of the western rather than the eastern division of the county, and which had but recently become

extinct at the time his 'Fauna' was published, is treated of at some length, indeed, his record of that noble species is the fullest that had been published to that date by any local authority, and contains certain facts derivable from no other source. The Stone-Curlew or Norfolk Plover, another bird of the heath and brecklands, was also an object of special interest with him, and his long residence at Eccles—in close vicinity to one of its main strongholds—afforded every opportunity for studying its peculiar habits.

To do justice, however, to Lubbock as a Norfolk naturalist, or fairly estimate the debt which every British ornithologist owes to his writings, we must consult that part of his work devoted solely to "water birds"—the ducks and waders of our broads and rivers, and the more marine species of our shores and salt marshes. Here, unquestionably, his personal experience, his power of observation, and descriptive writing, won for him a foremost place as an authority in such matters. To him we owe, as an author, the first recognition of the "Broad district" of Norfolk, as a paradise for the gunner and angler, comparable with any portion of the Lincolnshire and Cambridgeshire fens, even in their palmiest days; and yet, as he points out, whilst the latter are mentioned by all the older writers on natural history—not omitting Drayton in his *Polyolbion*—"Norfolk, though perhaps richer than any of these, is consigned to total oblivion." Yet Norfolk has its revenge in being still the stronghold of aquatic species long since banished from the now cultivated fens, and with such a chronicler as Lubbock, whose observations date back to a very early period of the present century, may fairly hold its own.

Reference has already been made to his admirable description of the working of a Decoy*, and of the fowl and other birds that frequent its quiet precincts, and amongst the most valuable of his bird-biographies, are those on the Great, Common, and Jack Snipe (snipe shooting being a sport in which he chiefly delighted), Ruff, Golden Plover, Lapwing, Redshank, Heron, and Bittern;—with the Godwit, Avocet, and Black Tern, amongst the species which had become extinct in our marshes within his recollection. There is also one other denizen of the broads, the Great Crested Grebe,

* This subject is illustrated in the 'Fauna' by two clever etchings by the late Miss Brightwell, representing the mouth and "purse net" of one of the "pipes" of Mr. Kerrison's Decoy at Ranworth.

which was always a favourite with Lubbock, and to whose habits, considering his opportunities for observing them, he has fortunately devoted much space in his 'Fauna.' It is moreover satisfactory to know that the fear he expressed lest this species, by constant persecution, should be spoken of in the next generation "as we now do of Bustards in the past tense," will be averted by the provisions of the "Sea-birds' Preservation Act," as well as by the almost universal desire shown by the proprietors of our broad waters to protect the "Loon," in particular, amongst our indigenous species.

As a specimen of his style of writing, for those who may never have perused his work, I can scarcely quote a more characteristic portion than the following sketch of the life and habits of the broadman of former days:—

"When I first visited the broads, I found here and there an occupant, squatted down, as the Americans would call it, on the verge of a pool, who relied almost entirely on shooting and fishing for the support of himself and family, and lived in a truly primitive manner. I particularly remember one hero of this description. 'Our broad,' as he always called the extensive pool by which his cottage stood, was his microcosm—his world; the islands in it were his gardens of the Hesperides—its opposite extremity his *ultima Thule*. Wherever his thoughts wandered, they could not get beyond the circle of his beloved lake; indeed, I never knew them aberrant but once, when he informed me, with a doubting air, that he had sent his wife and his two eldest children to a fair at a country village two miles off, that their ideas might expand by travel; as he sagely observed, they had never been away from 'our broad.' I went into his house at the dinner hour, and found the whole party going to fall to most thankfully upon a roasted Herring Gull, killed of course on 'our broad.' His life presented no vicissitudes but an alternation of marsh employment. In winter, after his day's reed-cutting, he might be regularly found posted at nightfall, waiting for the flight of fowl, or paddling after them on the open water. With the first warm days of February, he launched his fleet of trimmers, pike finding a ready sale at his own door to those who bought them to sell again in the Norwich market. As soon as the pike had spawned, and were out of season, the eels began to occupy his attention, and lapwings' eggs to be diligently sought for. In the end of April, the island in his watery domain was frequently visited for the sake of shooting the ruffs which resorted thither, on their first arrival. As the days grew longer and hotter, he might be found searching, in some smaller pools near his house, for the shoals of tench as they commenced spawning. Yet a little longer, and he began marsh mowing—his gun always laid ready upon his coat, in case flappers should be met with. By the middle of August, teal came to a wet corner

near his cottage, snipe began to arrive, and he was often called upon to exercise his vocal powers on the curlews that passed to and fro. By the end of September, good snipe shooting was generally to be met with in his neighbourhood; and his accurate knowledge of the marshes, his unassuming good humour, and zeal in providing sport for those who employed him, made him very much sought after as a sporting guide, by snipe shots and fishermen; and his knowledge of the habits of different birds enabled him to give useful information to those who collected them. These hardy fen-men, inured to toil and privation, were the great supporters of an old Norfolk pastime, as they doubtless thought it—"Camping." It required muscle and endurance of pain beyond common limits, and somewhat resembled the *pancratium* of the ancients, but was rather more severe."

It does not appear that subsequent to the publication of the 'Fauna,' in 1845, Mr. Lubbock contributed anything further to ornithological literature, even in "Notes" to Natural History journals, but his friendly correspondence on such subjects was by no means diminished through the popularity of his work, and, as the writer of this memoir can abundantly testify, he was ever ready to supply information and assist those whose kindred tastes led them to take up—where he had left it—the study of the 'Fauna of Norfolk.' Still residing at Eccles, as he had done since his appointment to the living in 1837, his clerical duties occupied his attention till within two years of his death, and his leisure time was chiefly devoted to reading when the infirmities of age and failing health forbade further indulgence in his former active pursuits. It was not till this period of his life that I first made the acquaintance of Mr. Lubbock personally, though well-known for some years as a correspondent. A visit to a friend in his immediate neighbourhood, in the summer of 1875, gave me the opportunity of calling upon him, and, though he was far from well at the time, and extremely feeble, I shall also remember that interview with peculiar satisfaction. His welcome to one whose interest in the Birds of Norfolk owes so much to his inspiration was hearty in the extreme, and in a very short space of time our conversation had ranged from the Bustard of the past to the irruption of Sand-grouse in 1863—an event which appeared to have interested him greatly at the time—and, as he brightened up with the discussion of his favourite topics, his recollection seemed as vivid as ever of events which had occurred when he first knew the broads, even to the number of "Loons" he had known in one

season to have nests at South Walsham. The mention of Surlingham led to the remark that within the last few years he had revisited that broad and was amazed at the small amount of water now visible, as compared with his recollection of the locality (dating back as far as 1819), showing the rapid growth of the peat and gradual closing up of the channels by the subsidence and consolidation of decaying vegetation. His appointment as an honorary member of this Society, very shortly after its formation, was referred to with warm expressions of gratification that his former efforts, in a like cause, should have been so acknowledged; and it was pleasant to witness the gratification which my announcement afforded him, that many counties in England as well as parts of Scotland could now boast of local "lists" and works descriptive of local faunas, following in this respect the example of Norfolk, and carrying to a successful issue the idea conveyed in the following passage in the preface to his book:—"It is from notes made by different observers in various districts as to the frequency or scarcity of species in the counties in which they reside, that the master naturalist must build up his system for a nation."

This ended our first and last interview. On the 20th of August, 1876, he wrote pleading the infirmities of age for not having sooner acknowledged my announcement of the appearance, in the previous January, of a fine male Bustard at Hockwold, and presenting me with an adult specimen of Baillon's Crake, shot by himself in the parish of Ranworth about five and twenty years ago. But in renewing his invitation for me to visit him once more at Eccles, he adds, with that prescience of impending dissolution so usual in advanced age, "if you can, come *soon*, I say soon, or you may not find me here." Too true, indeed, for that letter was the last he ever wrote! Many unavoidable engagements, unhappily, delayed my wished for journey, and scarcely three months later I received the announcement of his death, which took place on the 25th of November, in his 79th year, leaving a widow and six children, two sons and four daughters. He was spared, however, an impending bereavement, his eldest married daughter surviving her father only a few months.

Thus, full of years, beloved and respected, in his rural home, after thirty-nine years' residence in the same parish, died the rector of Eccles—but as the pebble dropped into the quiet pool, sends

eddying circles to its utmost bounds, so the little volume that bears his name has created waves of sympathetic feeling far beyond the limits of private friendship; and, whether at home or abroad, the simple obituary notice has doubtless drawn from the lips of many a naturalist the best, if even involuntary, tribute to his fame, "Richard Lubbock is dead!"

IX.

ORNITHOLOGICAL NOTES FOR 1876.

By Henry Stevenson, F.L.S.

Read 27th February 1877.

Bustard. The chief ornithological event of the year, in this county, was undoubtedly the appearance, early in January, in the Hockwold fens, of a male Bustard; the first, I believe, known to have been seen within the bounds of their former haunts in Norfolk*—although migrants have occurred from time to time on the coast—since the extinction of our local race in the year 1838;† when the Bustard ceased to be a "British Bird" in

* A bustard was recorded by Mr. Howlett, of Newmarket, in the 'Field' of August 16th, 1873, as recently seen on the Wangford and Lakenheath warrens; and the description of the bird said to have been observed there, answered to that of a Bustard.

† As stated in my account of this species in the 'Birds of Norfolk' (vol. ii, p. 15) there is no authentic evidence of our Norfolk race of bustards having existed later than the year 1838, when a female was killed at Dersingham, in the month of January, and another at Lexham near Swaffham, in the following May. The male birds were known to have died off prior to that time, and a few hens only survived of the once numerous Swaffham "drove." The female killed at Lexham and presumably the last of its kindred has been recently added to the fine series of Norfolk bustards in the Norwich Museum, the gift of the Rev. W. A. W. Keppel.

the true sense of the term, Norfolk to that date having been the last stronghold of this grand species.

Having been prevented by serious illness from paying my respects, personally, to this distinguished visitor, I am indebted for the following particulars to those brother ornithologists, who, more fortunate than myself and commiserating my disappointment, kept me well posted up as to their proceedings at the time.

It appears that on the 24th of January, Mr. H. M. Upcher, of Feltwell, being in the fen, was informed by one of his men that he had just seen a "wonderful cur'ous bird" in a piece of coleseed close at hand; and on going in search of it, to his delight and astonishment, ascertained that this was no other than a remarkably fine Bustard. The sun was shining at the time and he had a clear view of it, and on walking within a couple of hundred yards of the bird, it rose and flew round. The flight he describes as "grand, with a slow but powerful stroke." Happily the bustard had taken up its quarters in a portion of the fen belonging to Mr. Upcher; who at once took every precaution to insure its safety, beyond his boundaries by informing the neighbouring proprietors and their gamekeepers, that such a bird was in the fen and must be protected.

The spot itself is thus described by him in a communication to the Naturalist Editor of the 'Field':—*

"The field in which he had taken up his quarters is in the heart of Black-dyke Fen, in the parish of Hockwold; a poor crop of coleseed on one half of it, the other half not sown, in consequence of the very unpropitious weather we had last summer. A wide ditch on one side separates it from the 'drove' or road across the fen; at the other end is an osier belt; while the two remaining sides are flanked by dykes. The situation thus selected was a pretty safe one, as it would have been extremely difficult, if not impossible, to approach the bird within gunshot. This seemed to be its favourite feeding ground, to which it invariably returned when disturbed, and was almost certain to be found there at early morning. It appeared to feed much on the coleseed, biting off the tips of the leaves, as one of the farm men said, 'just like a sheep.'"

* A very full account of the occurrence of this bustard from the pen of Mr. J. E. Harting, including Mr. Upcher's narrative, appeared in the 'Field' of April 8th, 1876, and a shorter statement of the principal facts by Mr. Upcher himself, in 'The Zoologist' for the same year, p. 4882.

On the morning of the 25th, Mr. Upcher failed to see the bustard owing to a thick fog, but though absent from home for the next few days, the bird was reported as seen continuously, and he believes never quitted the field of coleseed, for a whole day, up to the 24th of February. Between the 2nd and 9th of February it was "interviewed" by several ornithological friends kindly informed of its whereabouts by Mr. Upcher, who in the meantime having communicated the interesting fact to Lord Lilford, of Lilford Hall, Northamptonshire, his lordship at once offered to send over a tame hen bustard from his own aviary to be turned off in the fen, in the hope that an alliance might thus be formed conducive to the acclimatization of the noble stranger. This liberal offer was of course accepted, and on the 9th Lord Lilford's keeper arrived from Oundle with his charge in a hamper; and the lady, having safely accomplished the journey, was duly fed and housed in a loose box for the night.

Of the proceedings on the following, the wedding morning, I should fail to give a correct impression without quoting at length from Mr. Upcher's graphic account as published at the time in the 'Field.'

"Feb. 10. Quite a warm spring morning. No better day could have been selected for making the experiment which we had in view. After breakfast the hen was taken up, placed in a large hamper well padded, and conveyed in a pony cart to the fen, while I collected the 'marriage guests.' These were Professor Newton, Mr. Edward Newton, Mr. O. Salvin, Messrs. F. and E. Newcome, and Mr. J. E. Harting." * * * "As we approached the spot where the bird was supposed to be, all glasses were brought into requisition, and after an anxious search we at length made it out, about four hundred yards away, standing perfectly still, with its back towards us, the sun shining brightly at the time. We decreased the distance by another hundred yards or so, and had another peep through the glass. We could see his fine yellow neck looking all the yellower in the sunlight, and watched him for some time as he walked slowly away from us, flirting and spreading his tail, which he carried higher than his back. As soon as we had all satisfied our curiosity, preparations were made for turning out the hen. With the assistance of the keeper I carried the hamper across the fen, in the direction of the wild bird, as near as I dared go without alarming him, whilst my friends remained behind on the 'drove.' Suddenly

the sun was obscured by cloud, a cold wind blew keenly, and snow began to fall. This was unfortunate; for, as the wind blew almost directly across the fen, the hen headed away up wind as soon as she was released. I tried to drive her gently towards her intended mate, but could not get her into the coleseed; she would keep on the bare fen. By this time I was getting pretty close to the wild bird, who, after moving away suspiciously for some yards, suddenly rose and flew away. Just as he was leaving, the hen rose, and, although the feathers in one wing had been slightly cut, she managed to fly about ten or a dozen yards and then pitched again. We fancied that the male bird as he passed over caught sight of her, for in less than half an hour he returned, and alighted in the coleseed again. Many were the comments made upon his flight, and although it was said that on rising with a heavy flap of wing he reminded one of a heron, or an eagle, yet when fairly launched this resemblance ceased. The quicker stroke of wing and outstretched neck reminded us then of a wild goose. The wings showed a good deal of white, the legs we could not see. Whether they were doubled up in front like an eagle, or carried straight out behind after the manner of a heron, did not appear. If the latter, as we suspect, they seemed not to project beyond the tail.

"During the interval which elapsed in the absence of the cock bird, I caught and carried the hen right into the coleseed, and had hardly set her down, and got back to the drove when he returned to his old haunt, pitching down, however, at a considerable distance from her. Here we thought it prudent to leave them; for, as they were now in the same field together, we had really accomplished the object of our excursion. Nothing could have been more satisfactory. Even the weather became accommodating, for the snow ceased and the wind blew less coldly. We watched the happy pair for some time through our glasses from the top of a stack, and then withdrew to the farmhouse, where we drank to the health of the bride and bridegroom, and the good housewife told us 'she hoped they would unite and live comfortable together!'"

These bright hopes, however, were not to be realized. On the 11th the weather became more severe, "with 12 degrees of frost and a thick mist which froze on the trees." The cock and hen were both seen during the day, but as the latter had one wing partially clipt to prevent her straying away, though still able to fly

across the narrower dykes, Mr. Upcher had a small hut built of hurdles and straw, into which she was driven and fed, the front being left open. On the 12th and 13th, both birds were seen together, and the male was reported as "strutting about and traping his wings like a turkey cock;" but on the night of the 13th the cold increased, with a cutting wind, and by the 14th the snow laid three or four inches deep on the ground. Still the male bird remained about the same locality, and the hen, though not visible, was supposed to be sheltering in her straw hut; but not making her appearance on the 15th after a rough night and torrents of rain, a search was made for her and the poor bird was discovered dead in one of the deep ditches, bordering the field she was in. This was most unfortunate, as the pair had taken so well to each other, and the chances of detaining the wild cock bird were very promising. In this emergency, Mr. Upcher again applied to Lord Lilford, who, in the most liberal and spirited manner offered to send another hen bustard, to continue the experiment, but with what effect will be best given in Mr. Upcher's own words.

"Feb. 21. Lord Lilford's keeper arrived with a second hen bustard, and we drove over at once to the fen. The cock bird was still there. It was blowing so heavily from the north-west with every appearance of a continuance of bad weather, that I hesitated to turn her out after her predecessor's untimely end, owing, as I feel sure, to the very inclement weather. So I put her into the hut, with this time a hurdle across the entrance, and left her. The cock bird was in the field, and by this time he appeared to have become accustomed to our presence.

"Feb. 22. The keeper saw the cock bustard about 100 yards from the hut, and went to let out the hen; but, unfortunately, while so engaged the cock took flight. Thereupon, as this hen's wings were uncut, he thought it more prudent not to let her out in his absence. This evening, the wind still blowing a gale from the north-west, the male returned, but, flying over the field in which the hen was, passed on about a mile to another spot, which he had been observed to visit before.

"Feb. 23. The male bird in the same field in which he had been seen to alight overnight. A boy going for some harrows put him up, but he alighted again almost immediately. The same afternoon he was seen flying towards Brandon.

"Feb. 24. The male bustard was seen to-day near Mildenhall, on the corner of Eriswell Warren.

"Feb. 25. The Maharajah's keeper reported the bird as seen to-day at Elveden, near Thetford. I have since sent to Lakenheath, Eriswell, and Mildenhall, but can hear no tidings of him, although most of the landowners in the neighbourhood, including the Maharajah Duleep Singh, Mr. Angerstein, Mrs. Lyne Stephens, and Mr. Amherst, had given orders for his protection."

It remains only to add, that the noble bird was not seen again in this county; and as we have had no subsequent record of any such bird having appeared in any other part of the kingdom, it is to be hoped that he escaped, uninjured, to safe quarters beyond the sea; and I feel sure that every member of the "Norfolk and Norwich Naturalists' Society" will heartily endorse the following remarks of Mr. Harting in the 'Field' in closing his very interesting narrative of the arrival and departure of this distinguished foreigner.

"The pains and trouble so recently taken by Mr. Upcher to preserve the bustard on his property, and the liberality displayed by Lord Lilford in his zealous endeavours to procure a brood, we feel sure will meet with the cordial approval of all true naturalists and sportsmen. We heartily wish that other owners of land suited to the habits of the Great Bustard would similarly exert themselves should opportunity occur. It should not be forgotten that the Great Bustard is a 'game bird,' and, although unhappily of rare occurrence in England at the present day, it is nevertheless still entitled, whenever it may be found, to the protection afforded by existing game laws. We may take this opportunity also, of stating that by 1 & 2 Will. IV., cap. 32, bustards are protected between the 1st of March and the 1st of September, and any person killing one between these two dates is amenable to prosecution and fine, besides being liable to pay the costs of prosecution."

Shore Lark. A considerable flock of these birds was observed in the salt marshes at Blakeney in the first week in January, and had possibly frequented that part of the coast for some time before they were observed. They were first seen by Mr. J. Tillard on the 3rd of the month, when he shot two out of a flock of about ten, and the next day three more. About a week later he killed six on

the "beach-way" nearest the sea; but they showed a decided preference for the salt marshes, and he only once saw them alight on the stones of the beach. He never saw more than fifteen or twenty in one flock, but they generally consorted, in small numbers, with snow buntings. On one occasion he killed a snow bunting out of a flock, and on going up to it found a shore lark sitting by it, which it seemed very disinclined to leave as he approached. These almost annual winter visitants, as they may now be termed in Norfolk, again made their appearance on our coast in October. At Yarmouth about the 26th, three males and two females were shot out of a small flock, and a much larger number at the same time frequented the beach and "backwater" at Salthouse.

Eider Duck. A female of this occasional winter visitant was shot at Kelling, near Holt, on the 2nd of January.

Wildfowl and the Winter of 1875—6. Altogether the winter of 1875—6 was remarkable for the dearth of wildfowl of all kinds, and that chiefly for the reason given in my previous notes. The severe but brief period of frost about the middle of January, brought a sprinkling of "hard weather" fowl to the waters of Breydon, consisting of some goosanders, golden eyes, and swans, with a few old birds amongst them; and on the 15th two fine male goosanders were sent to Norwich, which had been killed on the Beccles river.

Bittern. A male was shot at Weyborne on the 7th of January, a female at Hickling on the 3rd of February, and two in other parts of the county in the month of November.

Smews. Amongst the rarer species of fowl obtained this year on the coast, may be mentioned an adult pair of Smews, killed at Yarmouth in January.

Water Hens Migratory? Mr. Cordeaux, of Great Cotes, Ulceby, Lincolnshire, recorded in the 'Zoologist' (S.S., p. 4709), the appearance of a supposed migratory flock of these birds, in his neighbourhood on the 23rd of October, 1875; and Mr. J. H. Gurney informs me that a flock of about fifty was seen in a meadow at Keswick, near Norwich, on the 10th of February last. Mr. F. Norgate, also, tells me that, in the middle of

January, he found numbers of water hens on the stream which runs through the village of Sparham, near Norwich, many more than are usually seen in that neighbourhood; and after shooting all his dog could find in one day, the next, or even a few days later, he met with as many more, and this with only the barest shelter for them, in the way of sedges or rushes, on either side of the river. It would be interesting, were it possible, to ascertain how far these congregations of a species, rarely seen in flocks, is due to actual immigration, or to an inland migration of residents, driven out from the broads and fens of the county by such heavy floods as we have experienced during the last and previous winter. Snipe, plover, and other marsh birds at the period specially referred to (January and February, 1876), were either driven out of the county, or to the upland fields, from the extent of the floods; and even water hens cannot exist on an interminable waste of water, and would be likely, therefore, to migrate for a time to any streams and meadow lands affording food and foothold, essential to their well-being. Very large numbers of gulls and lapwings, in the early part of the year, were attracted to the meadow lands immediately surrounding this city—no doubt to feed on the drowned worms, as the waters subsided; and I heard strange stories of the rats, washed out of their haunts in the "Fens," committing great ravages upon the upland root crops and granary stores. In some places they might be seen collected in bunches on the trees, surprised by the sudden rush of the waters over the Fen banks; and boys, in boats, amused themselves by catching in buckets those found swimming about; seeking, like their antediluvian progenitors, some spot still raised above the rising flood. Woodcocks from a like cause, driven from low lying carrs and plantations, were shot in localities where they are rarely met with.

Hawfinch. A single bird was shot at East Carlton on the 2nd of February, one at Flordon on the 9th, and another at Sprowston near Norwich on the 26th; and on the 10th of March one was picked up dead at Catton under the telegraph wires. In the month of November, also, as I learn from the Rev. E. T. Frere, of Burston, some thirty of these birds were shot in the same garden at Diss, where as recorded in a previous number of the 'Transactions,' this species appeared in such numbers two years ago;

attracted no doubt to that particular spot by the number of yew trees. Mr. Frere happily succeeded in staying any further slaughter of these interesting birds, which have of late years so much increased as a resident species in Norfolk, that I believe all the above may be reckoned as home-bred, and not as winter migrants.

Siskins and Mealy Redpoles. Siskins, rather uncertain winter visitants, were plentiful in January, when our bird catchers procured a good many of these engaging pets, and a flock were seen on the 6th upon an alder tree at Northrepps. A single bird of this species was also netted with Lesser Redpoles as early as the second week in September. Mealy Redpoles, which seemed to be altogether absent in the winter of 1875, appeared in some numbers about the middle of October, and have since been plentiful, as much so almost as the Lesser Redpoles in the hands of the bird-dealers.

Great Gray Shrikes. On the 22nd of January a Gray Shrike was netted at Cossey, by a bird catcher, having struck at one of his call-birds. I have known of one or two similar captures of this species. Three or four specimens were also killed in different parts of the county during the late autumn and winter. Of two killed in November, a female on the 8th, at Horsey, and a male on the 30th, at Kimberley, the female exhibited a warm pink hue on the breast, with prominent semi-lunar markings on the under parts, generally, and almost as clear a grey on the back as the male. The male bird had far less of the semi-lunar marks, and those confined to the breast, and no pink hue whatever.

Magpie. I last year recorded the appearance on two occasions in the month of December, of six or seven magpies, at Weyborne; and the appearance of five in the same spot on the 17th of March, seems to indicate that, if unmolested, these birds would remain to breed in that neighbourhood. A single bird was killed at Northrepps on the 18th of January, probably one of the original group; and another was shot at Gresham, near Holt, in the same neighbourhood on the 14th of October.

Black-headed Gull. The passage of these birds from the coast to their nesting haunts, in spring, is so rarely observed, that the

following note will probably be of interest. On the 24th of February, Mr. Purdy, of Aylsham, when driving between Ingworth and Cromer, remarked an almost continuous flight of small gulls passing inland, and as some had distinct black heads he presumed they were all of this species. On reaching Cromer, he made out with his glass a large white mass of birds on the water, about a mile from the beach to be also small gulls. Similar flights were observed the same day from the North Walsham road pursuing a direct course inland.

Avocets. Two beautiful specimens were shot on Breydon on the 30th and 31st of March, and found their way into this city, notwithstanding the provisions of the "Wild Birds' Protection Act;" but it is to be hoped that the increased penalties under the Act just passed, may protect these and other similar migrants in future.

Puffin. An immature bird, storm driven, was picked up inland, at Cawston, about the middle of March, and another on the coast on the 29th.

Fork Tailed Petrel. A specimen of this Petrel, which was formerly considered a great rarity on our coast, but has of late years occurred in several instances, is said to have been obtained at Yarmouth in April of this year.

Spoonbills. A flock of eight was seen at Horsey, near Yarmouth, on the 13th of April, of which some five or six, at least, were shot subsequently in that neighbourhood. The same remark applies to the slaughter of these birds as to that of the avocets. A single spoonbill was observed on the Breydon "muds" early in June.

Hooded Crows observed in Summer. I know of no authentic instance of this species nesting in Norfolk; but stragglers are not uncommonly seen during the summer months, which bodes no good to the game preserver. On the 5th of May I saw a single bird in a field at Gunton, near Lowestoft, where, at the same season others have been remarked of late years; about the same time also one was observed, near Cromer, feeding with some rooks, and one at Northrepps on the 22nd of the same month.

Late Fieldfares.—Two examples of this species were remarked, on reliable authority, as late as the 3rd and 4th of May; one at Guist and the other at Foulsham. They uttered the usual winter note when disturbed. A pretty variety of this bird, with the feathers of the head nearly all white, was shot in January, in the county.

Little Owl. A very small owl, supposed to be *Carina noctua*, which had been seen at Northrepps on the 18th of May, was again observed near the same spot on the 16th of June.

Pochards and Tufted Ducks nesting in Norfolk. I last year recorded that I had seen on one of our inland Norfolk meres, three pairs of tufted ducks in the first week of June, and that from the actions of one hen bird I strongly suspected her nest, or a young brood, was not far off. This season I have pleasure in announcing that the nesting of the tufted duck in this favoured locality is an ascertained fact, a female having been flushed from her nest of six eggs on the 29th of May; two females and four males of this species being seen. At the same time and place, also, several pochards were found breeding, two females having broods of young ones, and one a nest of six eggs.

Great Crested Grebe. Through the Rev. H. H. Lubbock, of Hanworth, I have lately become acquainted with a new inland haunt of this species, viz., Gunton lake, near Cromer. For the last three years, he tells me, a pair have nested on the lake, and have averaged about three young ones each season. This year the eggs were hard sat on by about the 29th of April; and the old birds are said to arrive almost to a day in March and leave as punctually in September. One young one, last year, got entangled in a net, as they occasionally do on the broads, but was fortunately rescued in time.

Gunton Heronry. This thriving colony continues to increase. At least forty birds were counted at their nests this year at the beginning of the breeding season.

Strange nesting place of a Pheasant. A hen pheasant hatched off her brood, on the 2nd of June, in a nest made in the ivy growing against the east wall of Northrepps Cottage, near Cromer, about twelve feet from the ground, and brought off five chicks, two or three others being killed by the descent.

Red-necked and Gray Phalaropes. A male of the rarer species, the red-necked phalarope, was killed at Yarmouth, on the 19th of June; and a single gray phalarope, fast assuming its winter plumage, early in November.

Stilt Plover. Since I recorded last year the occurrence of two specimens of this rare wader, in Norfolk, one at Ingham on the 26th of May, and one at Ditchingham about the end of July, I have ascertained that a bird of this species, either a third example, or possibly the same subsequently shot at Ditchingham, was observed, on several occasions, in June, in the Hellesdon meadows, about two miles from Norwich. Mr. John Henry Walter, who resides at Hellesdon, informs me, that he first saw the bird on the 6th of June, and described it in his note-book, at the time, as having "long red legs, white body, and black pointed wings, about the size of a plover. It flew like a heron, with its legs out behind it." Altogether he saw it about half-a-dozen times, always about the same locality, and could have shot it easily as it flew close to his boat, or when feeding on the land.

Sand Martins nesting in sawdust heaps. Travellers by the Cambridge line of the Great Eastern Railway will have observed, for many years past, large quantities of sawn fir timber closely adjoining the Brandon Station, and which with the addition of huge stacks of sawdust piled up on the spot, give evidence of a busy trade. In these stacks of wood fibre, firmly compressed and consolidated by the action of the weather, sand martins have of late discovered a novel, and I believe hitherto unrecorded, nesting place. I was first informed of this curious fact, by Mr. Edward Bidwell in the summer of last year; and an ornithological friend residing in the neighbourhood confirms the same from his own observations this season, having found the sand martins, in considerable numbers, boring into the firm, but easily worked strata of these wooden cliffs.

Purple Heron. A young bird of the year, in similar plumage to the last two specimens obtained in this county, was killed at Ranworth, on the 10th of November, but had been previously shot at and wounded in the leg.

LESSER-SPOTTED WOODPECKER. A bird of this small and scarce species was killed in a garden at Diss on the 24th of November.

SNOWY OWL. About the 2nd or 3rd of November, a fine specimen, which had been previously wounded, was shot by Lord Leicester's keeper in the Burnham Overy Marshes; the same recorded in the 'Field' of November 18th.*

THE MIGRATION OF ROOKS, SKYLARKS, ETC., AS OBSERVED ON THE COAST. In my last year's Notes I referred to the large increase observable in autumn, in ROOKS and JACKDAWS, owing to migratory arrivals on our coast; and I may now add that a considerable flock of the former were observed at Northrepps on the 31st of March, apparently departing by sea. On the 12th of October a considerable migration of SKYLARKS was witnessed on the same point of the coast, the birds pursuing a direct course S.W. by W.; and on the 3rd of November, and again on the 12th, 13th, and 14th, very large flocks of WOOD PIGEONS were observed at Northrepps, early in the morning, apparently coming in from the sea.

RAVENS. This fine species is sufficiently scarce for a record of the fact, that two were seen at Overstrand, near Cromer, on the 20th of November; and Mr. F. Hele also records in the 'Field,' of November 24th, having seen three at Aldborough.

GREEN-BACKED GALLINULE (*Porphyrio smaragnotus, Temm.*). I am indebted to the Rev. E. W. Dowell, of Dunton, for particulars respecting a bird of this species, which was killed in West Norfolk, about the 10th of October, in the parish of

* It is worth mention that in the 'Ibis' for January, 1877 (p. 131), is a notice by the editor, on the authority of Dr. T. M. Brewer, of "an unusual migratory inroad of snowy owls in the north-east portion of the United States during the past autumn." They were remarked in flocks of fifteens and twenties passing south, and were obtained "in large numbers, so that the taxidermists could not prepare all that were brought to them." The editor also adds, "the same phenomenon has also manifested itself in the Eastern Hemisphere. Three examples of the snowy owl, one of which was captured in Ireland, are now in the Zoological Society's Gardens. Mr. Cross, the well known dealer at Liverpool, says, he never had so many of this bird. Every steamer from America brings in two or three, so that, at one time, he had nearly thirty in his possession."

Tatterford, on the upper waters of the Wensum, by a gamekeeper named Platten, then in the service of Mr. Dugmore. The bird was skinned and roughly set up by Platten, and on quitting Mr. Dugmore's service, shortly after, he took it with him to Wroxham, where his father acts as keeper to Mr. Blake-Humfrey. It was there seen, in his possession, by Mr. Harvey Blake-Humfrey, who succeeded in securing it for Mr. Dowell, and on being sent to a Norwich birdstuffer to be restuffed it was examined by Mr. J. H. Gurney, Junr., and others, and found to be an adult specimen of the Green-backed Porphyrio, of Africa, and not the European Purple or Hyacinthine Gallinule (*Porphyrio veterum*). Both species are figured in the last number of Dresser's 'Birds of Europe,' issued in December, 1876; and in describing the Green-backed species that author remarks, "This southern representative of the Purple Gallinule, differing in having the back green instead of blue, is found on the north side of the Mediterranean as an extremely rare straggler." * * * "On the south side of the Mediterranean, however, throughout Africa, as far south as the Cape of Good Hope, the present species is very generally distributed, entirely taking the place of the European Purple Gallinule." Mr. J. H. Gurney, Junr., as stated in his 'Rambles of a Naturalist,' met with it in Egypt, where, as he points out, Captain Shelley probably confused it with *Porphyrio veterum*. It is worthy of mention that a bird of the same species was also obtained, last autumn, in Scotland, as recorded in a recent number of the 'Scotch Naturalist'; but though both Greenbacked and Purple Gallinules have occurred in several, and in about an equal number of instances in this country, the fact of their being so frequently brought over in ships and kept in various parts of England, not only in aviaries but in a semi-wild state on lakes and ponds, renders it impossible to decide whether these stragglers are escaped birds or voluntary migrants to our coasts. In the present instance the perfect plumage and cleanness of the feet and legs of the specimen, and its sharp claws, seemed to indicate that it had not been in confinement; but specimens which Mr. J. H. Gurney, Junr., has had alive for some time, will still bear comparison in all these points with Mr. Dowell's bird. A notice of its fate in the local papers and 'Land and Water,' failed to find an owner for it.

MIGRATORY WADERS. A TURNSTONE was shot at Blakeney as early as the 13th of August, which, like a flock I saw passing along the beach at Cromer, on the 15th, was in nearly full summer plumage; adult SANDERLINGS in summer plumage were also shot at Blakeney on the above date. A flock of about forty LITTLE STINTS frequented the beach at Salthouse in October, of which several were shot during the first week of the month, and others on the 26th. Several PIGMY CURLEWS were also shot on Breydon during the first week in October, and an immature SPOTTED REDSHANK late in December.

RAPTORIAL MIGRANTS. I last year recorded the occurrence of an unusual number of young SEA EAGLES on the Norfolk coast, between the months of October and December, 1875; and others were either seen or killed in the early part of the present year, 1876. On the 22nd of January one was shot at Fritton Decoy, near Yarmouth, the same recorded in 'Land and Water,' of the 5th of February, as a golden eagle; and another was also killed near Yarmouth, about the same time. A third straggler frequented the woods at Sheringham, for more than a fortnight, towards the end of February and beginning of March, and was, I am glad to say, not molested. Another bird of this species made its appearance in the same locality about the 9th of November; and one was killed on the Westacre estate, near Swaffham, in December, as recorded in the 'Field' of January 6th, 1877. ROUGH LEGGED BUZZARDS which were also numerous in 1875, have been even more plentiful this last autumn and winter. Two immature birds were shot towards the end of January, at Northrepps, and Beeston Regis near Cromer, and the autumnal flight was marked by the appearance of one in the same neighbourhood on the 30th of October; and in November I saw four specimens, all young birds, killed in various parts of the county. In December I have also notes of four others; three killed in the neighbourhood of Yarmouth, and one at Northrepps, where a very dark coloured bird, supposed of this species, was observed on the 29th. Of the so-called COMMON BUZZARD, I have notes of one shot at Horningtoft, on the 22nd of September; and another was sent to Norwich to be stuffed, on the 2nd of December. The HONEY BUZZARD, an occasional visitor to our coast, has occurred in several

instances during the past autumn, both in this and adjoining counties. An immature female was killed near Diss on the 16th of September, which was said to have struck down a partridge; a somewhat unusual fact in connection with this species, though similar instances have been recorded. Both birds were secured. Two large hawks seen at Northrepps on the 5th of October were believed to be of this species; and Mr. Baker, birdstuffer, of Cambridge, informs me that on the 6th of November he received a Honey Buzzard from Fordham, near Downham Market, in Norfolk, one from Caxton, in Cambridgeshire, on the 8th; and another about the same date from Sudbury, Suffolk. All, including the Fersfield bird, were in immature plumage.

The spring and autumn migration of the OSPREY was marked by the capture of one at Hempstead near Holt, on the 20th of April; and it is with regret that I record the fate of one shot at Guist on September 24th, one on South Walsham Broad on the 28th, and another at Sennowe about the same time, which had frequented that neighbourhood for some days. A HOBBY was seen at Northrepps on the 25th of April; and one was shot in September at Fersfield, near Diss. The PEREGRINE also made its usual appearance in various parts of the county. On the 8th of January an adult female was shot at Brancaster on the coast, another female on the 15th at Melton Constable, and an adult male about the 18th of February. A fourth in nearly adult plumage was brought into Norwich on the 30th of October; and an immature bird was killed at South Walsham early in November. The only other raptorial species worth notice, as occurring during the year are, an immature GOSHAWK, somewhat a rarity in Norfolk, killed at Melton Constable in February, or early in March; a MONTAGU'S HARRIER procured in the same locality on the 19th of January; and a HEN HARRIER at Sheringham on the 24th of April. The unusual abundance of the SHORTEARED OWL during the past autumn, is referred to under a separate heading.

ABUNDANCE OF SNIPE, PLOVER, ETC. IN THE EARLY WINTER. The beginning of November was remarkable for the very unusual number of Snipe which were met with at that time on our broads and marshes, and large bags were made by those fortunate enough to hear of their arrival in time to take advantage of it. From

fifteen to five-and-twenty couples in a day were, I understand on good authority, killed in favourable localities, and this not only in the "Broad district," but in the salt marshes on the coast. These birds, according to some accounts, literally poured in upon us, just in advance of the sudden change to frost and snow, which commenced on the 6th and lasted till about the 11th or 12th. From that time, as was the case last year under very similar circumstances, both Snipe and fowl have been scarce, the weather remaining open, whilst these early flights have passed on to the south, to return only in March on their way northwards in spring. Of the common Lapwing, large flocks were seen at Northrepps on the 1st of November, going west; and on the 4th large numbers were observed passing W.N.W., and from their cries it would seem that their flight continued also during the night of the 4th, or at least some part of it. About the 15th, immense flocks of Lapwings and Golden Plovers were observed in the same neighbourhood, at Beeston Regis, and up to the close of the year the numbers of both Golden and Gray Plovers reported on the western side of the county, at Lynn, was very unusual. Woodcocks were plentiful towards the end of October. On the 28th, some ten or twelve couples were exhibited for sale in our fishmarket. Early in the same month wild-fowl were reported as unusually plentiful at Salthouse; and on the 9th wild Swans were seen off Blakeney, and about a week later others were observed out at sea, off Cley harbour. On the 9th a flock of over two hundred wild Geese flew over Northrepps, in a N.W. direction, flying high and making much noise; and about the same time I learn that fowl in unusual numbers were heard passing over Breydon, near Yarmouth, but the nights were too dark for the gunners to do anything with them. Inland, and within a mile or two of Norwich, wild Swans were seen on the wing, and a great many fowl frequented the low meadows both morning and evening.

Abundance of Shorteared Owls. The autumn and early winter of 1876, have been remarkable for the number of Shorteared or Woodcock Owls, as they are commonly known to sportsmen, from occurring usually at the same time with *Scolopax rusticola*—that have been met with, not only on the coast, but very generally distributed inland. Between the 20th and 31st of October some

thirty specimens, at least, were brought in from various localities to our Norwich bird stuffers, and others since that date. The same apparent excess of numbers in this migratory species has been recorded, as observed concurrently in more northern counties, both in England and Scotland on the east coast, and the superabundance of field mice in certain districts in Scotland and Yorkshire since the spring of the year, has led somewhat to the impression that the excess of ground vermin, is accountable in some degree for the unusual plenty this autumn on our shores, of Owls and Buzzards. Whether this is the cause or not as regards other counties, I know of no complaint amongst the farmers in Norfolk of any great increase in field mice during the past autumn; although the excessive rains and consequent floods in the low lying districts may have driven such "small deer," in unusual quantities, on to the upland farms. But if we have been free from such a plague, I think the perceptible increase in Shorteared Owls is easily accounted for, without the assumption that any unusual immigration of the species has actually occurred. These birds alighting according to their annual migratory custom on the northern shores of Great Britain would soon discover the abundant provision of their favourite food, as reported from Scotland and Yorkshire, and first arrivals, instead of passing on after a brief rest, would remain to enjoy the feast, and be reinforced by other flights, till these congregated forces eating their way southward in unusual numbers would naturally give the impression that a remarkable migration of the species had occurred, rather than that their normal flights had thus become more concentrated.

With reference, however, to this question of Owls and Mice, I may refer my readers to an interesting letter in the 'Gentleman's Magazine' for 1754, volume xxiv, p. 215, on a great influx of Norway Owls at Hilgay, Norfolk, owing to a plague of Field Mice in the "Fen district;" and this we may presume happened in an exceptionably dry season, rather than in such a one as we have experienced this last autumn and winter. The following curious capture of an owl of this species occurred in a marsh at South Walsham on the 11th of March last. A lad crossing the marshes on his way home from work in the "dark hour," observed a Lapwing sweep past him pursued by a larger bird: they took no notice of him, and both fell to the ground within a few yards of the spot

where he was standing, when, creeping carefully towards them, as they laid struggling on the marsh, he threw a sack he had been carrying over the two, and then killed them both. The Owl was brought next day to one of our Norwich birdstuffers, and the species thus identified.

GUILLEMOT INLAND. On the morning of the 2nd of December, a common Guillemot was captured in the garden of the Rev. T. S. Norgate, at Sparham, some 15 miles from the coast, flapping about on the gravel walk, but apparently quite uninjured.

BLUE TIT AND REDSTART NESTING IN HUMAN SKULLS. The following strange incident was lately communicated to me by the Rev. W. Blyth, of Fincham, near Downham, in Norfolk, respecting a nesting place of the common Blue Tit. "Early in the present century," he writes, "say 1804 or 1805, a man named Bennett was tried at Thetford, executed and gibbeted, in a certain lane at Wereham, for the murder of his master, one John Filby. About 1819, John Camplin, of this parish, now aged 75, had the bold curiosity to climb the gibbet and examine the skeleton. On reaching the head there flew out, first, an old Blue Tit, and after her the terrified family of nine or ten; one only remained, and was secured by the venturesome explorer." A somewhat similar freak on the part of a Redstart, came under my notice last summer at Saffron Walden where, in Mr. Gibson's garden, a large number of skeletons, forming part as was supposed of a Saxon burial ground, were then exposed to view. In one of the skulls, gaining access to the interior through one of the orbits, a Redstart had made a nest and hatched her young.

X.

NOTES ON THE METEOROLOGICAL OBSERVATIONS

Recorded at Norwich during the year 1876.

By John Quinton, Jun., Assistant-Secretary.

Registrar to the Norwich Meteorological Society.

January.

The first three days of January were showery and mild; the thermometer at 9 p.m. the 3rd, registered 50.0, but early on the 4th the wind backed to E., and at 9 a.m. the temperature was only 39.5. A period of very cold weather ensued, which lasted until the 17th, the mean temperature being 30.7; the thermometer never rose above 36.0, and on the 8th, 12th, and 16th it was below freezing all day. The wind was chiefly from the N.E. and E.N.E., a strong gale being recorded on the 7th; the sky was mostly overcast, and several slight showers of snow and sleet were recorded. During the last fourteen days the winds were mostly light from the S., and the temperature averaged 40.4; but considerable variation was recorded, for on the night of the 19th the *lowest* was 43.8, whereas on the day of the 22nd the *highest* was only 37.8. Rain fell from 1 to 9 p.m. on the 21st, followed by snow and sleet; the last ten days were very calm and mostly fine, but with thick fogs in the mornings and evenings. Throughout January the barometric pressure was very unusually high, only fell below 30 in. on the 20th and 21st; the rainfall was 0.18 in. deficient.

February.

The mild weather lasted during the first three days, the temperature at 9 p.m. the 3rd being 42.0; but the wind veered from S.W. to N.W. early on the 4th, and at 9 a.m. the thermometer stood at 35.0. This was succeeded by a very cold period until the 15th; the sky was mostly overcast, and frequent slight showers of snow, sleet, and rain were recorded. Strong N.W., N., and N.E. winds blew from the 4th to the 7th, when the daily velocity was 278, 268, 335, 283 miles respectively. The mean temperature from the 4th to the 14th was 33.4; the temperature on the 11th was

below freezing all day: there was very slight variation in the barometric pressure, which oscillated between 29.8 and 29.9. A heavy fall of snow occurred early on the 14th: it was 3 in. deep at 9 a.m., but a rapid thaw set in soon after, and at 9 a.m. the 15th, the temperature was 45.0—12 degrees higher than the previous day. The last fortnight was much milder, averaging 45.7, but the sky was mostly overcast; frequent slight showers of rain, and strong W. and S.W. winds with considerable oscillation in the barometric pressure. The mean barometric pressure for February averaged unusually low: it only rose above 30 in. on the first three days and on the 24th. The rainfall was 1.28 in. in excess of the average, and the largest amount recorded in February since 1866.

March.

This month was remarkable for the unusually low barometric pressure and heavy S.W. and W. gales. The mean barometric pressure was 4-10ths of an in. below the usual average; and in no month during the last six years have the readings averaged so low, nor has the wind averaged so high a velocity. Mr. Glaisher states that at Greenwich during the last thirty-five years, the mean barometric pressure has never been so low in March as in this year. The temperature during the first fifteen days was generally slightly above the average, but the days were very cloudy and frequent showers of rain occurred. The barometer oscillated slightly at about 29.6 in. during the first week with strong S.W. and W. winds; then fell rapidly on the 8th from 29.629 at 9 a.m. to 28.996 at 9 p.m., and further to 28.645 at 9 p.m. the 9th, when a daily velocity of 331 miles was registered: the readings remained below 29 in. until the evening of the 11th, when they reached 29.195. Another quick fall to 28.730 at 3 p.m. the 12th, was followed by a rapid rise to 29.542 at 9 a.m. the 13th; after which the pressure fell to 29.091 on the 15th, when a strong W.S.W. gale of 436 miles was recorded. A strong W.N.W. and N.W. gale of 350 and 406 miles occurred on the 17th and 18th. From the 16th of March to the 27th (except the 24th) the weather was very cold, with frequent snow storms, and frosts nearly every night; on the 18th the highest temperature was only 5 degrees above freezing, and was followed by a frost of 6 degrees in the night. Early on

the 28th the wind veered to S.E., the temperature rose 15 degrees and the remaining days were very mild, but the sky generally overcast. Rain fell on 17 days during March, and exceeded the average by 7-10ths of an inch.

April.

April commenced with very fine mild weather, with light variable winds, high barometric pressure, and a mean temperature of 50.9 for the first nine days. On the 8th a rapid fall in the barometric pressure commenced and continued to 29.165 on the 10th; attended by strong S.W. and S. gales on the 9th and 10th, and also by a great fall in the temperature. On the 8th the thermometer registered 65.0, but on the 11th the maximum was only 43.0, and on the 13th only 39.5. The mean temperature from the 10th to the 17th was 41.5; frequent showers of snow, hail, and sleet were recorded. A severe snow storm occurred early on the 13th, and at 9 a.m. the snow was 3 in. deep. The barometric pressure increased to 30.308 on the 15th with N.E. winds, followed by a fall to the unusually low reading of 28.925 on the 19th, with light S.E. and S.S.E. winds; this was succeeded by a rise to 30 in. on the 23rd, after which no unusual oscillation was recorded. Rather milder weather ensued from the 18th to the 29th, the temperature averaging 49.3, but the sky was generally overcast and cloudy; frequent showers of rain were recorded, and a thunderstorm with hail occurred on the 25th. On the 29th of April the wind veered to N., and the last day of the month was very cold and cloudy, the maximum temperature only 45.5. The total rainfall in April was 1.29 in. above the average of the last thirty-five years, and has only been exceeded in three years during that period.

May.

This month was unusually dry, with cold, gloomy weather, and the mean temperature about 2 degrees below the average: this deficiency occurred in the day temperatures, which averaged 4 degrees too low; the night temperatures were about the usual mean; only one night of frost was recorded. The first three days were very cold and cloudy, with N.N.W. winds; the thermometer fell to the freezing point on the night of the 3rd.

On the 4th of May the wind veered to S.E., and three fine, bright days were recorded; the thermometer reached 63.0 on the 5th. This was followed by very cold, dry weather, with N. and N.E. winds until the 19th; the mean temperature from the 7th to the 19th was only 47.2, and the thermometer never rose above 57.0. The barometric pressure during the first three weeks of May was high and very steady; on the 21st it fell below 30 in. for the first time, and oscillated slightly at 29.7 on the next five days, attended by frequent showers of drizzling rain, with light S.W. and N.W. winds. On the 27th the barometer again rose to 30 in., and the remaining days were fine and much milder. The rainfall was 1.47 in. deficient, and the smallest amount recorded in May during the past thirty-five years.

June.

The mean temperature of June was at about the normal value, but the winds were very variable, causing unusual variation in the day temperatures. The thermometer on the 1st with a S. wind reached 71.5, but on the 10th with a strong N.N.W. gale the maximum was only 55.5. On the 12th, which was a calm day, 76.0 was recorded; but early on the 16th the wind veered to N.W. and the maximum was only 56.8. This was succeeded by a change of wind to S.W. and S.E., and an increase of temperature to 77.2 on the 20th; followed by a maximum of only 62.0 on the 23rd with a N.E. wind. On the 28th the thermometer reached 81.2 with a S.W. wind, but at 5 p.m. the wind veered to N., a thunderstorm occurred at 8.15 p.m., and at 9 p.m. the temperature was only 56.0—a fall of 25 degrees—and the maximum on the following day was only 66.2. The atmospheric pressure during June was unusually even, the monthly range being only half-an-inch, and that occurring in the first three days between 30.242 at 9 a.m. the 1st, and 29.662 at 9 p.m. the 3rd: the subsequent oscillations were very slight at about 29.9 and 30 in. The rainfall in June exceeded the average of the past thirty-five years by 0.19 in.

July.

The mean temperature of the first nine days of July was 66.2; but the sky was generally very cloudy and overcast,

the winds light, chiefly from the S.W. The 1st was showery a heavy shower also occurred between 1.30 and 3 a.m. on the 7th, and rain fell on the 8th, attended with much thunder and a little lightning. The 10th and 11th were colder, the maximum temperature being only 67.2 and 65.0; the thermometer rose to 80 degrees on the 13th, and four very hot and fine days followed with maxima temperatures of 84.5, 84.0, 83.0, and 81.0. During the last fortnight of July very considerable variation was recorded in the day temperatures: on the 19th with a strong N.W. wind from 7 a.m. to 5 p.m., the thermometer only reached 67.0, but on the 22nd, 81.0 was registered. On the 23rd the maximum was only 65.8: a heavy shower occurred at 9.40 a.m., and rain lasted until 1 p.m., amounting to 0.43 in., with thunder and a little lightning; at midnight there was much lightning without thunder. Rain fell from 9.30 a.m. to 12.45 on the 24th, and the maximum temperature was only 65.0. At 6 a.m. the 26th the wind veered to S.W., and the thermometer again reached 81.0; three cold and cloudy days followed with maxima of only 68.0, 66.0, and 67.0; the 30th was fine, but the 31st cloudy and showery. The night temperatures during July were very even and only varied 10 degrees; the mean monthly temperature was 1.5 above the average of the last six years. The barometric pressure for July averaged at about 1-10th above the usual mean; no remarkable variation was recorded. Rain fell on only eight days in July, and was 0.23 in. below the average of the last thirty-five years.

August.

The first few days of August were cloudy and showery; a fall in the barometric pressure from 30.037 at 9 a.m. the 2nd, to 29.417 at 9 a.m. the 3rd, was attended by a fall of 3-10ths of rain between 5.30 and 11 a.m. the 3rd, and followed by a rather strong S.W. wind until 4 p.m., with a quick rise in the barometer to 30.227 at 9 p.m. the 5th. A fortnight of very fine weather was recorded from the 6th to the 19th of August; barometric pressure was very steady, and no rain fell; the winds were light and variable from the 6th to the 10th, followed by light E. winds until the 19th. The days were mostly intensely hot, the thermometer registering above 80 degrees on five days; there was,

however, considerable variation in the temperature, for on the 9th the maximum was 84.6, but on the following day the highest was only 68.5 with a night temperature of 50.2. On the 13th, 14th, and 15th the maxima were 86.0, 87.0, and 85.0, with night temperatures of 61.0, 60.0, and 58.8; the highest minimum in the month was 64.5 for the night of the 18th. The 20th, 21st, and 22nd, were mild but cloudy, and a little rain fell; the remaining nine days were very cold, sky overcast and cloudy, and frequent showers of rain were recorded; the maximum temperature on the 25th was only 58.5 followed by a night temperature of 42.0. Frequent oscillation in the barometer was recorded during the last week of August; the greatest was from 29.667 at 9 a.m. the 30th to 29.108 at 3 p.m. the 31st, the lowest reading recorded in August during the last six years. A strong wind with a velocity of 303 miles in 24 hours was recorded on the 27th, from the W. until 1 p.m.; and from W.N.W. from 4.30 to 9 p.m. A gale from the W.S.W. was recorded from 9 a.m. to 5 p.m. on the 29th; the velocity in the 8 hours was 129 miles. The rainfall in August was 0.71 in. below the monthly average.

September.

This month was remarkable for the excessive rainfall; rain fell on 21 days, and the total fall, 5.25 in., was the largest amount recorded here in September in the last thirty-five years, and was 3.06 in. in excess of the average. During the first 7 days the unusual amount of 2.84 in. was recorded; 0.92 in. of which fell between 4.0 and 9.0 a.m. on the 6th. Excepting the 15th, 19th, 21st, and 22nd, which were fine days, the sky was generally overcast and cloudy. The winds during September were mostly light from the W.N.W. and W.S.W.; the only strong gale was from the W.S.W. and W., from midnight on the 24th to 5 p.m. on the 25th, when the velocity was 267 miles in the 17 hours. A meteor of extraordinary brilliancy was seen at 6.30 p.m. the 24th. The mean temperature of September was about 1.5 degrees below the average, which deficiency occurred in the day temperatures; for on 11 days the temperature did not rise above 60 degrees, and on the 13th the maximum was only 52.5. The night temperatures were rather warmer than usual; the lowest was 43.0 on the night of the 15th. The barometric readings in September

averaged low, but no remarkable variation was recorded. Mr. Glaisher states, that at Greenwich the mean barometric pressure for September has only twice in the last thirty-five years averaged so low as in this year.

October.

The mean temperature of this month exceeded the average of the last six years by 4.8 degrees, and was the mildest October recorded in that period; the excess occurred chiefly in the night temperatures, which were 7 degrees above the average; the day temperatures were only 3.4 in excess. Mr. Glaisher states, that at Greenwich, the mean temperature of October has only been exceeded eight times in the last hundred years. The unusually high temperature of 71.8 was recorded on the 7th, and the lowest during the month was only 39.0. The month commenced with a strong N. wind on the 1st, with a quick rise in the barometer from 29.740 at 9 a.m. to 30.161 at 9 p.m. The weather was unusually mild until the 19th, but the sky was generally overcast; several showers of drizzling rain were recorded; the winds were mostly light from the S. until the 15th, and from the E. from the 16th to the 19th. Frequent variation in the barometer was recorded, but no unusual oscillation occurred; the readings were generally below the average. From the 20th of October until the end of the month the days were much colder, the highest temperature being only 55.0. The sky was very overcast; the winds variable, blowing strong from the N.E. and E.N.E. on the 21st and 22nd, and from the W.N.W. on the 31st. The barometric pressure from the 20th to the 31st was high and very steady, all the readings being above 30 in. The rainfall was the smallest amount recorded in October since 1861; it was 2.09 in. below the average of the last thirty-five years.

November.

This month was unusually dull and gloomy, but mild (except from the 7th to the 13th), the mean temperature being about 2 degrees above the usual average. Rain fell on 22 days, but the showers were mostly very slight, and the total fall exceeded the average by only 0.38 in. The first six days were mild and showery, with light variable winds, sky generally overcast, and

high barometric pressure. From the 7th to the 13th the weather was much colder, winds chiefly from the N. and N.E.; the 9th and 10th were unusually cold; the maxima temperatures were only 37.0 and 38.8 followed by night temperatures of 26.5 and 27.0; snow fell on the 8th and 9th, and a thick fog occurred on the evening of the 10th. A sudden fall in the barometric pressure was recorded on the 11th and 12th; at 9 p.m. the 10th it registered 30.196; at 9 p.m. the 11th, 29.809; and at 9 p.m. the 12th, 29.319 attended by a strong E.S.E. wind on the 12th. From the 14th of November to the end of the month, the weather was much milder, the sky generally overcast; drizzling rain and light showers were frequently recorded, the winds mostly very light from the E., S.E., and S.W. Frequent oscillation was recorded in the barometric pressure; the greatest fall was from 30.230 at 9 a.m. the 23rd to 29.392 at 3 p.m. the 25th; followed by a rise to 29.686 at 9 a.m. the 26th, and subsequent fall to 29.247 at 9 p.m. the 27th, after which the pressure rose to 29.713 on the 30th.

December.

This month was very remarkable for the great atmospheric variations, low barometric mean pressure, high temperature, and for the excessive rainfall, making the month one of the most remarkable on record. At 9 p.m. the 2nd of December the barometer registered 29.344, fell to 28.943 at 9 p.m. the 3rd, followed by a further fall of 0.566 in. in next 18 hours, recording 28.377 at 3 p.m. the 4th—the lowest observation registered here since January 13th, 1843. The fall in the barometer was attended by a strong S.E. wind, from 9 a.m. to 3 p.m., when it veered to the S.W.; from whence a strong gale was recorded until 10 p.m., the barometer rising 0.381 in. between 3 p.m. and 9 p.m. On the 5th, which was squally with drizzling rain all day, another fall from 28.983 at 9 a.m. to 28.631 at 9 p.m. was recorded, succeeded by a quick rise to 30 in. on the 9th. No unusual variation was recorded during the next week; the weather continued very mild, but the sky was generally overcast; winds light and variable. On the 15th of December the barometric pressure began to decrease, and a gradual fall was recorded to 28.789 at 9 a.m. the 21st; the weather was very mild, but cloudy, damp, and showery; winds light from the E. and S.E. This was

ROLOGICAL REGISTER.

	Lowest.	Mean daily Range.	Mean Temperature.	Rain.	No. of days on which it fell.	WIND. Direction. N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Mean daily Velocity.
WINTER.		°	°	In.										Miles.
December, 1875		7.0	38.7	1.70	14	0	4	2	1	5	8	8	3	172
January, 1876.....		9.0	36.3	1.58	11	2	6	5	2	10	4	1	1	169
February, 1876		9.2	40.3	2 62	20	3	2	0	2	4	9	7	2	212
Dec. 1875 to Feb.		8.4	38.4	5.90	45	5	12	7	5	19	21	16	6	184
Six preceding Win		9.6	37.5	5.70	39	6.5	4.5	11	8.5	20	16.5	15.5	7.5	184
SPRING.														
March, 1876		10.8	40.2	2.23	17	2	2	2	2	3	10	7	3	255
April, 1876		14.7	46.4	2.80	16	3	3	6	5	3	6	3	1	189
May, 1876		14.2	48.4	0.39	9	8	9	1	3	0	4	3	3	202
March to May,		13.2	45.0	5.42	42	13	14	9	10	6	20	13	7	215
Six preceding Spr		16.5	45.8	3.99	32	14.5	7.5	12.5	7	9	12	14.5	15	188
SUMMER.														
June, 1876		17.1	57.2	1.96	13	7	4	5	2	5	2	2	3	171
July, 1876		17.9	63.6	2.23	8	5	1	3	3	2	10	3	4	166
August, 1876		18.0	62.1	1.45	13	0	2	8	3	1	11	3	3	174
June to August,		17.6	61.0	5.64	34	12	7	16	8	8	23	8	10	170
Six precdng. Sum		18.4	59.8	6.28	34	11	7.5	10	7	13	14.5	19	10	169
AUTUMN.														
September, 1876		12.5	54.7	5.25	21	1	0	1	5	2	5	8	8	158
October, 1876		9.6	53.4	0.67	12	1	2	6	5	9	3	4	1	162
November, 1876 ..		7.8	43.8	2.71	22	3	1	6	5	4	5	1	5	154
Sept. to Nov.,		10.0	50.6	8.63	55	5	3	13	15	15	13	13	14	158
Six precdng. Aut		12.9	48.8	7.75	42	6	7	10	8	18.5	18	15.5	8	171

succeeded by five cold days, with E. and N.E. winds, a little snow falling on the 24th; the barometer rose rapidly to 30.248 at 9 a.m. the 26th, a cold day with the temperature below freezing until the evening, when 32.0 was recorded at 9 p.m. On the 27th of December a remarkable change occurred; the barometer fell 0.353 in. on the night of the 26th, followed by a strong S.E. and S.S.E. gale on the 27th; and the temperature rose from 32.0 at 9 p.m. the 26th to 55.0 at the same hour on the 27th. The remaining days were very mild, cloudy, and squally, with frequent oscillation in the barometric pressure at about 29.400. The mean temperature of the month was the highest that has been recorded for December during the past six years. It exceeded the average by 7 degrees, and in no month during that period has the mean barometric pressure averaged so low. Mr. Glaisher reports that no instance of so low a mean reading of the barometer has been recorded at Greenwich, in any month during the last thirty-five years; and only nine instances in the last hundred years of so high a mean temperature in December. The total rainfall in December was 3.61 in., exceeding the average by 1.64 in. The total rainfall for the year, 27.50 in., was 3.82 in. in excess of the average.

XI.

MISCELLANEOUS NOTES AND OBSERVATIONS.

Mammalia.

The white-beaked Dolphin *(Delphinus albirostris)*. Mr. J. W. Clark of Cambridge, records the occurrence of a specimen of this rare Cetacean off Lowestoft, on the 26th March, 1876, in the proceedings of the Zoological Society for 1876, pp. 686—691. It was taken by the fishermen off Lowestoft, by whom it was called a "White-beaked Bottlenose," and at once secured for Mr. Clark, and despatched to Cambridge. The animal was a male, quite young and weighing 139 lbs. The principal measurements were as follows:—length from anterior edge of upper lip to notch in

middle of caudal fin, 5 ft. 5½ in. Length from upper lip to notch in middle of caudal fin (following curve), 5 ft. 10 in. From upper lip to anterior edge of dorsal fin (following curve), 2 ft. 6 in. Total vertical height of dorsal fin, 6 in. Pectoral fin, length from junction of anterior edge with body to tip, 1 ft; pectoral fin, greatest breadth, 4½ in. Breadth of caudal fin across the flukes, 1 ft. 3 in. A figure is given, but the coloration Mr. Clark says, was singularly beautiful, and he fears no drawing could give any adequate idea of it.

The following is Mr. Clark's description :—

"The upper part of the body generally was a glossy black, and the under a creamy white. The upper lip (before described) was white, with a black spot at the tip, and a few irregular pale grey cloudings on its surface. The convex forehead was at first white for half an inch on the right side, and a quarter of an inch on the left; this white space was bounded by a wavy line of black spots of different dimensions, including a subtriangular space of a brownish colour, 2 inches broad, dotted with darker spots.

"Immediately behind the blow-hole was an ogee of black, 1⅛ inch deep, succeeded by a space of light brown colour 8½ inches wide by 9 inches deep. Beyond this the whole upper surface of the body was black till about 18 inches from the tail, when it became grey. At a point 10 inches from the centre of the tail this grey ceased, and the tail became black above and below. The underside of the caudal fin was irregularly streaked with grey; and there was a white spot on the raphé.

"Behind the eye and just above the pectoral fin was an irregular patch of light yellowish brown flecked with numberless spots and dashes of brown of more than one shade, with an occasional black mark. There was a long narrow band above this and between it and the dorsal fin, sparingly spotted; and a second space, marked like the first, commenced at about the middle of the band and extended backwards to a point halfway between that and the tail. The markings upon both of these cannot be better described than by comparing them with those upon a sheet of blotting-paper that has been much used. They were thickest at the sides of the space, of which a small portion, just in the centre, was free from markings altogether. Between these spaces the black was less intense; a band of it, however, extended between the second space and the white of the belly.

"The pectorals were black above and below; and a few grey markings, which maintained a uniform width of about 6 inches, extended beneath them over the white undersurface of the body, till at the anus the dark grey colour of the sides curved downwards and narrowed the white to less than half its width. Behind the anus there was a patch of light brown about 6 inches long, succeeded by black as described above."—P. Z. S. 1876, p. 688.

Dr. Cunningham also records in the same volume pp. 679—686, the occurrence in September, 1875, of a female of this species—also a young one—taken off Great Grimsby. Both specimens are figured on the same plate, and differ considerably from each other in outline and coloration; they both differ, however, still more from Mr. Brightwell's figure in the 'Annals and Magazine of Natural History', Vol. XVII., the accuracy of which, Dr. Cunningham shows reason to doubt; and institutes a searching comparison of the figures given by Brightwell, Van Beneden, and himself, from which, and the skeletal peculiarities of the specimens where recorded, he arrives at the conclusion, that they are all of the same species. Mr. Clark does the same with Mr. Moore's specimen, 'Annals and Magazine of Natural History', series 3, Vol. XI. p. 269 (1863), and arrives at the same conclusion.—T. SOUTHWELL.

BOTANY.

PYROLA MINOR.—Several specimens of this plant were found at Peddam on the day of the Society's excursion in June last; this satisfactorily disposes of the doubt expressed (Trans. 1874—5, p. 96), as to the occurrence of more than one species of Pyrola in the county.—H. D. GELDART.

FUNGI ON WHALE'S BONES. On the 9th of August, 1875, a young whale (*Balænoptera musculus*, Linn.) was stranded at the mouth of the river Ouse. After the blubber had been removed, the bones were purchased by the West Norfolk Farmers' Manure Company, with the intention of utilizing them for agricultural purposes. It so happened, however, that these bones were too large to be conveniently ground in the bone mill, and they have been left in the open air until the present time (March, 1877).

Last summer they were covered by an abundant growth of a bright orange *Fusarium*, which occurred indiscriminately upon

all the bones. On the bodies of the vertebræ I found several species of *Mycetozoa*, especially a *Physarum*, which I regarded at the time as *P. nutans* Pers., but which my friend Mr. Phillips thinks is *Didymium rufipes Fr.* The most remarkable Fungi, however, were two *Agarics* which grew upon the skull, *Agaricus bullaceus* Bull., and *Agaricus ostreatus* Jacq. The former is not at all a common species. I have only seen it once before, when it grew upon a rotten mat that had been buried in a manure heap. The latter agaric grew upon some dry cerebral matter in the interior of the cranium. A succession of fine specimens have occurred during the winter. Its proper abode is dead wood, especially Laburnum, and it is very curious that an esculent species should choose such an unsavoury matrix as the skull of a whale.—CHARLES B. PLOWRIGHT.

XII.

FAUNA AND FLORA OF NORFOLK.

PART VII. DIATOMACEÆ.

BY F. KITTON, HON. F.R.M.S.

RATHER more than a century and a quarter ago, there lived in Norwich an untiring student of natural history, particularly that portion of it requiring the aid of magnifying glasses for its examination: the name of William Arderon is now probably known to few modern naturalists, although in his day he was highly esteemed by men far above him in social position. He came to Norwich as an excise officer; and the *savans* of the city, rather than lose him when his duties terminated in that locality, made him manager of the New Mills at a salary of £60 per year, which situation he retained until his death.

During his residence in Norwich, he was made a Fellow of the Royal Society, and contributed many papers to their Transactions.

The ditches around the city were laid under contribution, and he was often rewarded for his trouble by the discovery of something "new and strange." Sometime in July, 1745, he discovered

in a ditch in Spring Gardens, Norwich, what he calls the "Hair animalcule" (*Oscillatoria limosa*), and of which he sends figures and description to the Royal Society. Mixed with this form he detected a number of minute organisms, which taxed the highest magnifying powers he possessed, to make out. He sent some of them to Baker, the celebrated microscopic observer, under the name of the "Oat animalcule;" and from the figure and description I have no doubt this was a species of Navicula, very probably *N. amphisbæna* or *N. sphærophora;* and if I am correct in my surmise, the first diatom ever described or figured was a Norfolk specimen.

In compiling the subjoined list, I have had to depend almost entirely on my own observations and specimens: no records of the labours of earlier observers (many of whom studied those remarkable forms with great assiduity) have been preserved.

The late Mr. Brightwell published in 1848, a small book called a 'Sketch of a Fauna Infusoria for East Norfolk' (I need hardly remark that at this time the animal nature of the Diatomaceæ and Desmidiæ was scarcely doubted): in this work he describes and figures the following species:—*Bacillaria paradoxa, Navicula striatula*=*Surirella striatula, Navicula phœnicenteron*=*Stauroneis phœnicenteron, N. amphisbæna, N. hippocampus*=Pleurosigma, a "Navicula" which he does not name, but the drawings clearly indicate it to be *Campylodiscus costatus.* He also gives figures of an Amphiprora, possibly *A. paludosa, Bacillaria* (*Diatoma*) *vulgare, Pyxidicula* = *Cyclotella operculata* and *Cocconema* = *Navicula didyma.*

He subsequently described some species of Triceratium, Chætoceros, and Rhizosolenia found in this county, in the 'Quarterly Journal of Microscopical Science;' but his studies in later years were devoted to the forms found in guano, fossil deposits, and exotic gatherings.

Campylodiscus clypeus was first found living in brackish water ditches near the Berney Arms, by the late Mr. R. Wigham; a species previously supposed to be peculiar to a fossil deposit found at Eger in Bohemia, and was first described in Ehrenberg's Microgeologie; accompanying this form were two species of Navicula: *N. bohemica* and *N. sculpta.* In Mr. Wigham's Breydon gatherings, *C. clypeus* was also associated with these two forms; the former

species has not, I believe, been found in any other British locality.

I have observed *Campylodiscus clypeus* mixed with the beforementioned Navicula in a gathering from the Great Salt Lake, Utah: this gathering is so like those made at Breydon, that were it not for a few species not hitherto found in Great Britain, it would be difficult to distinguish them.

The very remarkable little form doubtfully referred by Professor Smith in his Synopsis to the genus Triceratium (*T. exiguum*), has hitherto only been found in Ormesby Broad: it was first observed some four-and-twenty years ago in gatherings made from that locality by Mr. H. G. Glasspoole, and it is still found in the broad.

The late Dr. Arnott and other diatomists considered this form to be a variety of *Odontidium mutabile*, an opinion with which I do not concur: I should be more inclined to refer it to *O. parasiticum* (if it be not a distinct species). It is frequently found adhering by one of the angles to other diatoms, particularly *Nitzschia sigmoidea*, and associated with *O. parasiticum*. Mr. Brightwell has described and figured it in the 'Quarterly Journal of Microscopical Science,' but his figures are incorrect: the centre of the valve is not punctate and the margin is striate.

Achnanthidium ventricosum=*Monogramma ventricosa*, Ehr., I had the pleasure of detecting in the washings from moss growing at the foot of some willows on the Osier Car, Heigham. This species, I believe, had never before been found in Britain or even in Europe; it occurs in great abundance in a subpeat (?) deposit from "Cabbage Tree Swamp," New Zealand, and also in a gathering from the mouth of a cave in the New Hebrides; I have also seen it sparingly mixed with other diatoms collected at Petropaulovski.

The pretty little species *Pinnularia globiceps* was first detected by the late Dr. Gregory (see 'Quarterly Journal Microscopical Science,' vol. iv), in a gathering from Flordon, I think made by Mr. Brightwell. I have never been fortunate enough to find it myself, although I have carefully examined material from that locality.

In some moss growing on the trunk of an elm on the Earlham Road, I found *Dendroteres spiralis*, Ehr.=*Orthosira mirabilis*, Gregory, mixed with *Navicula appendiculata* and *N. undosa*.

The arrangement adopted (with some alterations) is that used by Herr Grunow in his work on Austrian diatoms.

Class CRYPTOGAMIA.

Sub-class ALGÆ, Natural Order DIATOMACEÆ.

Family I—EUNOTIÆ.

Genus EPITHEMIA KÜTZING.

E. TURGIDA. (Sm.) Horning Fen, Ormesby Broad, Whissonsett.
E. OCELLATA. Kütz. Flordon Fen.
E. ZEBRA. Kütz. Brackish-water ditches, Breydon.
E. CONSTRICTA. (Sm.) Occurring with the above.
E. GIBBA. Kütz. Nearly pure in a gathering from a ditch running into Ormesby Broad, more or less common in all fresh-water gatherings.
E. VENTRICOSA. Kütz. Ditches, Breydon.
E. MARINA. (Donk.) In sand gatherings from Hunstanton, Wells, Brancaster.
E. MUSCULUS. Kütz. Ditches, Breydon.

Genus EUNOTIA EHRENBERG.

E. TETRAODON. Ehr. St. Faith's Common, Edgefield, near Holt.
E.? LUNARIS. (Bréb.) Near the mouth of the Yare—rare.

Genus HIMANTIDIUM EHRENBERG.

H. PECTINALE. (Kütz.) Osier Car, Heigham; Ormesby Broad.
H. GRACILE. Ehr. In a gathering from Stratton Strawless, very rare. (Mr. Brightwell.)

Family II—MERIDIONEÆ.

Genus MERIDION AGARDH.

M. CIRCULARE. Ag. Occurring in many fresh-water gatherings, but only in series of four or five frustules.

Genus PODOSPHENIA EHRENBERG.

P. EHRENBERGII. (Kütz.) On *Ceramium rubrum*, Cromer.

Genus Rhipidophora Kützing.

R. abbreviata. Kütz. Growing on sea-weed attached to a buoy at Scratby.

Genus Eucampia Ehrenberg.

E. zodiacus. Ehr. Stomachs of Noctilucæ, Yarmouth—rare.
E. britannicus. (Sm.) Found with above—very rare.

Family III—DIATOMA.

Genus Diatoma Decandolle.

D. vulgare. (Bory.) Rare—in a gathering from Poringland.
D. elongatum. (Ag.) In water supplied by "Norwich Water Company."
D. grande. (Sm.) Rare—in gatherings from Ormesby.

Genus Odontidium Kützing.

O. mutabile. (Sm.) Common—in gatherings from Horning Fen; Osier Car, Heigham; Hellesdon Bridge; Ormesby Broad.
O. tabellaria. (Sm.) Associated with the above.
O. parasiticum. (Sm.) Growing on *Nitzschia sigmoidea*, Ormesby Broad.

Genus Fragilaria Lyngbye.

F. capucina. (Desm.) Frequent in fresh-water ditches.
F. virescens. (Ralfs.) Found in the same localities as the above species.
F. tenuicollis. (Heiberg.) Ormesby Broad.

Genus Synedra Ehrenberg.

S. radians. (Sm.) Abundant in fresh-water gatherings.
S. radians var. (Sm.) Flordon Fen; Ormesby ditches.
S. ulna. Ehr. Common—Whissonsett, Cossey, Horning, Heigham.
S. capitata. Ehr. Common—Flordon, Ormesby, Whissonsett, Poringland, Horning.
S. acicularis. (Sm.) Breydon ditches.
S. minutissima. (Kütz.) Rare—Whissonsett, Ormesby.

S. AFFINIS. (Kütz.) Not uncommon in the Breydon ditches.

S. INVESTIENS. (Sm.) Thickly covering *Cladophora rupestris*, growing on some floating timber at Scratby.

S. PULCHELLA. (Kütz.) Occurring in most salt and brackish-water gatherings, but not plentifully.

S. VAUCHERIA.? (Kütz.) A small Synedra occurs in the Ormesby gatherings, which I doubtfully refer to this species.

S.? CYMBIFORMIS. (Schmidt.) Very rare—stomachs of Noctilucæ, Yarmouth; Hunstanton Sands.

Genus ASTERIONELLA HASSELL.

A. FORMOSA. Hassell. Rare—Ormesby Broad; in a pond on Mousehold Heath, Mr. Brightwell.

A. ELEGANS. (Heiberg.) In sediment from water supplied by the Water Company, Norwich.

A. BLEAKELEYII. (Sm.) Rare—Yarmouth sands, mixed with *Chætoceros armatum.*

Genus DORYPHORA KÜTZING.

D. AMPHICEROS. Kütz. Brackish-water ditches, Yarmouth, Breydon, Wells; sand gatherings, Hunstanton; stomachs of Noctilucæ, Yarmouth.

Genus TABELLARIA EHRENBERG.

T. FLOCCULOSA. (Kütz.) Ormesby, Horning; Osier Car, Heigham.

T. FENESTRATA. (Kütz.) I have only found this form in the Ormesby gatherings.

Genus GRAMMATOPHORA EHRENBERG.

G. MARINA. (Kütz.) Growing luxuriantly on sea-weed attached to Scratby buoy.

Genus RHABDONEMA KÜTZING.

R. ARCUATUM. Kütz. Very fine and pure on *Ceramium rubrum*, Cromer.

Genus STRIATELLA AGARDH.

S. UNIPUNCTATA. Ag. Very rare—on sea-weed, Cromer.

Family IV—SURIRELLEÆ.

Genus CAMPYLODISCUS EHRENBERG.

C. COSTATUS. (Sm.) Apparently rare in this county, a few frustules occurring in gatherings from Whissonsett, Tittleshall, Hickling, and St. Faith's

C. ECHENEIS. Ehr. Rare—brackish-water ditches, Breydon.

C. PARVULUS. (Sm.) Associated with the preceding species.

C. CLYPEUS. Ehr. Very pure and fine in a ditch near the Berney Arms; first found living by the late Mr. R. Wigham.

C. BICOSTATUS. (Sm.) Very rare—in a ditch at Breydon.

Genus SURIRELLA * TURPIN.

S. BISERIATA. (Bréb.) This species occurs sparingly in the Hickling, Whissonsett, and Tittleshall gatherings.

S. SPLENDIDA. (Kütz.) Hickling, Cossey, Tittleshall.

S. CONSTRICTA. (Sm.) Very rare—in a ditch near Breydon.

S. GEMMA. (Ehr.) Copious in gathering from the North river, near Yarmouth; more or less common in all brackish-water localities.

S. STRIATULA. Turp. Very copious and fine in all the Breydon ditches.

S. APICULATA. (Sm.) Rare—St. Faith's Common.

S. BRIGHTWELLII. (Sm.) Plentiful in a gathering made by the late Thomas Brightwell, Esq., at Titchwell, but rare in other brackish water localities.

S. OVATA. (Kütz.) More or less common in slightly brackish or fresh-water ditches; copious in a ditch at Keswick.

S. OVALIS. (Bréb.) Rare—Breydon, Burgh, Titchwell.

S. SUBSALSA. (Sm.) Very rare—in a Breydon gathering.

S. LINEARIS. (Sm.) Associated with *S. splendida*, of which it is probably a variety.

Genus CYMATOPLEURA SMITH.

C. SOLEA. Sm. Common—in all fresh-water gatherings.

* Pfitzer, in his work, "Ueber das Bau und Entwicklung der Diatomaceen," changes the name to Suriraya, this genus having been named after Dr. Suriray.

C. ELLIPTICA. Sm. Not so plentiful as the above species, but usually accompanying it.

C. APICULATA. Sm. Rare—only in the Whissonsett gathering.

Genus AMPHIPLEURA KÜTZING.

A. PELLUCIDA. Kütz. Not unfrequently in the Ormesby gatherings, but rare in other localities.

Family V—NITZSCHIÆ.

Genus DENTICULA KÜTZING.

D. KÜTZINGII VAR. MAJOR. (Grunow.) Ormesby and Horning.

D. SINUATA. (Sm.) Common on moss growing at the base of willows, Osier Car, Heigham.

Genus NITZSCHIA HASSELL.

N. SIGMOIDEA. (Sm.) Copious in a ditch running into Ormesby Broad; not frequent in gatherings from other localities.

N. SIGMA. (Sm.) Very frequent in salt-water ditches; a form with a very coarse striæ occurs in a ditch in Burgh.

N. AMPHIOXYS. (Sm.) Plentiful in moss from Osier Car, Heigham; rare in soil attached to roots of Equisetum, growing near the river, at Hellesdon. Mr. Norman in his "List of Diatomaceæ occurring in the neighbourhood of Hull," says, he found it frequently in moss from cottage roofs.

N. VIVAX. (Sm.) Frequent with preceding species in the Heigham moss. This is usually considered a brackish-water form, but the water in this locality is quite free from salt.

N. HYALINA. (Greg.) Hunstanton sands.

N. DUBIA. (Sm.) Breydon, North River; salt-water ditches, Yarmouth, Wells, Blakeney.

N. OBTUSA. (Sm.) Rare—in the Whissonsett and Flordon gatherings.

N. MINUTISSIMA. (Sm.) Moss, Osier Car, Heigham; not unfrequent on wet walls.

N. LINEARIS. (Sm.) Whissonsett, Ormesby, and Horning.

N. BILOBATA. (Sm.) Occurring in most of the Breydon gatherings, but not plentifully.

N. PLANA. (Sm.) Found with the above, but rare.

N. VIRGATA. (Roper.) Sand gatherings, Hunstanton and Wells.

N. SPATHULATA. (Sm.) Very rare—in sand gatherings from above localities.

N. SOCIALIS. (Greg.) I have detected a few frustules occasionally in the Hunstanton sand gatherings.

N. PANDURIFORMIS. (Greg.) Wells and Hunstanton sands—rare.

Genus TRYBLIONELLA SMITH.

T. SCUTELLUM. Sm. Very rare—I have only found this in one of the Breydon gatherings.

T. GRACILIS. Sm. Frequent in the Breydon gatherings; more rarely in those from Hunstanton, Wells, and Yarmouth.

T. PUNCTATA. Sm. Frequent with the above.

T. ANGUSTA. Sm. Cossey, Whissonsett, Weston.

Genus HOMEOCLADIA AGARDH.

H. SIGMOIDEA. (Sm.) Rare—in a gathering off the piles of Yarmouth Jetty.

Family VI—ACHNANTHEÆ.

Genus COCCONEIS EHRENBERG.

C. SCUTELLUM. Ehr. Growing on *Zostera marina*, Yarmouth; sand gatherings, Hunstanton.

C. PEDICULUS. Ehr. Ormesby, Whissonsett, Heigham Causeway.

C. PLACENTULA. Ehr. Horning, Hickling, Tittleshall, Whissonsett.

Genus ACHNANTHIDIUM KÜTZING.

A. LINEARE. (Sm.) Rare—in a fresh-water ditch, Yarmouth; a few isolated frustules in the Ormesby gatherings.

A. VENTRICOSUM. (Ehr.) Rare—in moss from Osier Car, Heigham.

A. FLEXELLUM. (Bréb.) Ormesby, Flordon, Horning.

Genus Achnanthes Bory.

A. longipes. (Ag.) Apparently rare—in this county I have only found a few detached frustules; in a tide pool at Cromer.

A. brevipes. (Ag.) Copious in a gathering from Lynn; a few specimens were also found in a sand gathering from Hunstanton.

Genus Rhoicosphenia Grunow.

R. curvata. (Sm.) Not unfrequent in fresh-water gatherings copious in a fresh-water ditch, Yarmouth.

Family VII—CYMBELLÆ.

Genus Cymbella Agardh.

C. Ehrenbergii. (Kütz.) More or less frequent in all fresh-water gatherings.

C. maculata. (Kütz.) Whissonsett, Cossey, Holt, Horning; in most fresh-water gatherings, but not plentiful.

Genus Cocconema Ehrenberg.

C. lanceolatum. Ehr. Common—in most fresh-water gatherings.

C. cistula. Ehr. Generally associated with the above species.

C. cymbiforme. Ehr. Ditches, Heigham, Whissonsett, Flordon, Horning.

C. parvum. (Sm.) Cossey, Flordon—rare.

Genus Encyonema Kützing.

E. prostratum. (Ralfs.) Ormesby Broad; not common.

E. cæspitosum. Kütz. Mixed with the preceding species.

Genus Amphora Ehrenberg.

A. ovalis. (Kütz.) Copious in a ditch at Hethersett; more or less frequent in all fresh-water ditches.

A. affinis. (Kütz.) Frequent in brackish-water gatherings.

A. minutissima. (Sm.) Ormesby Broad.

A. ARCUS. (Greg.) Sand gatherings Hunstanton, Wells.
A. ARENARIA. (Donk.) Found with the above.
A. GREVILLIANA. (Greg.) Sands, Wells and Hunstanton.

Genus PALMERIA GREVILLE.

P. VULGARE. (Kitton.)=AMPHORA COMPLEXA. (Gregory.) Rare —sands, Hunstanton and Wells.

Family VIII—GOMPHONEMAÆ.

Genus GOMPHONEMA AGARDH.

G. GEMINATUM. Ag. Rare—in the Ormesby gatherings.
G. ACUMINATUM. (Ehr.) Frequent—Cossey, Flordon, Ormesby, and all fresh-water ditches.
G. VIBRIO. (Ehr.) Ormesby and Horning.
G. OLIVACEUM. (Ehr.) St. Faith's, Heigham, Flordon, Whissonsett.

Genus NAVICULA BORY.

N. GRANULATA. (Bréb.) Wells, Hunstanton, and Brancaster sands—common.
N. HUMEROSA. (Bréb.) Associated with the above species.
N. RECTANGULATA. (Greg.) Same habitats as above.
N. PALPEBRALIS. (Sm.) Same habitats as above.
N. CANCELLATA. (Donk.) Rare—in the Wells gathering.
N. LYRA. (Ehr.) Rare—in the Wells gathering.
N. RETUSA. (Bréb.) Frequent in the Hunstanton gatherings.
N. FORTIS. (Greg.) Hunstanton, Wells.
N. CLUTHENSIS. (Greg.) Hunstanton, Wells, Breydon.
N. OVALIS. (Kütz.) Breydon, Hunstanton, Brancaster.
N. (Pinn.) GIGAS. (Ehr.) Hickling broad. This form is referred to *N. nobilis*, Ehrenberg, by the author of the 'Synopsis of British Diatomaceæ,' a species not found in this county and probably not in Great Britain.
N. (Pinn.) CARDINALIS. (Ehr.) Very frequent and fine in the Hickling Broad gathering.
N. DIDYMA. (Kütz.) Copious—Hunstanton and Wells; rare in the Breydon ditches.

N. APIS. (Ehr.) Rare—Hunstanton sands.

N. BOHEMICA. (Ehr.) Rare—in the Breydon ditches.

N. SCULPTA. (Ehr.) This species is probably only a variety of the preceding; it is somewhat more frequent but not plentiful. Breydon ditches.

N. ELEGANS. (Sm.) Nearly pure in a Yarmouth gathering; Breydon and Wells—rare.

N. (Pinn.) PEREGRINA. (Sm.) Common in most brackish-water ditches.

N. CRUCICULA. (Sm.) Breydon, Wells, Lynn.

N. SUBSALINA. (Donk.) Frequent in all brackish-water localities.

N. (Pinn.) RADIOSA. (Sm.) Common in all fresh-water ditches and streams.

N. HENNEDYII. (Sm.) Very rare—in one of the Breydon gatherings.

N. INFLATA. (Sm.) Whissonsett, Flordon, Cossey, Holt, Ormesby; this occurs, although sparingly, in all fresh-water localities.

N. GIBBERULA. (Sm.) Parish drain, Ormesby; the broad, Hickling; Whissonsett.

N. LÆVISSIMA. (Sm.) In most of the Ormesby gatherings, but not frequent.

N. AMPHISBÆNA. Bory. This species is present in all fresh-water gatherings.

N. SERIANS. (Kütz.) Nearly pure in a small pond on Edgefield Heath; more or less common in all fresh-water ditches.

N. RHOMBOIDES. (Ehr.) Edgefield, Whissonsett, Ormesby, Flordon; this is not a common species in this county.

N. CRASSINERVIA. (Bréb.) Sparingly mixed with the above.

N. CUSPIDATA. (Kütz.) Whissonsett, Ormesby, Holt; not frequent; it also occurs in one of the Breydon ditches in which there is a considerable influx of fresh water in this habitat. The outline of the valve slightly differs from that of the type form, the sides being slightly rounded.

N. AMBIGUA. (Ehr.) Occurs in the same localities as the preceding species but is less frequent.

N. RYNCHOCEPHALA. (Kütz.) Flordon, Whissonsett; common in most fresh-water streams.

N. SPHÆROPHORA. (Kütz.) Copious—Whissonsett; frequent in fresh-water ditches.

N. ELLIPTICA. (Kütz.) Breydon, Whissonsett, Flordon.

N. INTEGRA. (Sm.) Rare—in a brackish-water ditch, Yarmouth.

N. ANGLICA. (Ralfs.) Moss, Osier Car, Heigham; Whissonsett, Ormesby.

N. (Pinn.) VIRIDIS. (Sm.) Common—in all fresh-water ditches.

N. GENTILIS. (Donk.) Whissonsett, Ormesby, Cossey.

N. (Pinn.) GIBBA. (Ehr.) Holt, Flordon, Cossey.

N. (Pinn.) DISTANS. (Sm.) Rare—in stomachs of Noctilucæ, Yarmouth; sands, Hunstanton and Wells.

N. BACILLUM. (Ehr.) Frequent—in a gathering from Hickling, but I have not obtained it from any other locality in this county.

N. BACILLARIS. (Greg.) Whissonsett and Ormesby.

N. CYPRINUS. (Ehr.) Breydon, Wells, Yarmouth, Hunstanton.

N. (Pinn.) GLOBICEPS. (Greg.) Found by the late Professor Gregory, in a gathering from Flordon, sent to him by Mr. Brightwell.

N. MARINA. (Ralfs.) Very rare—Breydon, Wells, Yarmouth, Hunstanton.

N. MINUTULA. (Kütz.) Wells, Hunstanton.

N. (Pinn.) NODOSA. (Sm.) Moss, Osier Car, Heigham.

N. UNDOSA. (Ehr.) Ormesby Broad; moss, Osier Car, Heigham.

N. APPENDICULATA. (Kütz.) Moss, Osier Car, Heigham.

N. ATOMUS. (Kütz.) Moss, Osier Car, Heigham.

N. (Stauroneis) ASPERA. (Ehr.) Rare—Yarmouth, Wells.

N. CLEPSYDRA. (Donk.) Frequent—Hunstanton and Wells.

N. FOLLIS. (Ehr.) Very rare—moss, Osier Car, Heigham.

N. JENNERI. (Sm.) Common—in salt-water ditches, Breydon, Wells, Hunstanton, Lynn.

N. CONVEXA. (Sm.) Rare—Wells and Breydon.

N. ELGINENSIS. (Greg.) Ormesby, Whissonsett.

N. LIBER. (Sm.) Wells ditches.

N. FIRMA. (Kütz.) Frequent—in fresh water.

N. (Pinn.) OBLONGA. (Kütz.) Very common—Horning, Ormesby, Whissonsett, Cossey.

N. (Stauroneis) PUNCTATA. (Kütz.) Rare—in moss washings, Heigham, Whissonsett.
N. (Pinn.) BOREALIS. (Ehr.) Moss from trees, very rare.
N. LINEATA.? (Greg.) Wells—rare.
N. MAXIMA. (Greg.) Wells sands.
N. HYALINA. (Donk.) Very rare—Hunstanton.
N. VARIANS. (Greg.) Moss, Osier Car; Whissonsett.
N. CRUCIFORMIS. (Donk.) Rare—Wells.
N. SCUTELLOIDES. (Greg.) Ormesby Broad.

Genus PLEUROSIGMA SMITH.

P. ELONGATUM. Sm. Common—in the Breydon and Wells gatherings.
P. STRIGOSUM. Sm. Common—in brackish-water localities.
P. ANGULATUM. Sm. Frequent—in all salt-water ditches.
P. QUADRATUM. Sm. This species is almost invariably associated with the preceding, of which probably it is only a variety.
P. ELONGATUM. Sm. Ditches, Breydon and Wells.
P. ÆSTUARII. Sm. Not common—Hunstanton sands.
P. MARINUM. (Donk.) Wells and Hunstanton sands.
P. BALTICUM. Sm. Frequent and fine—in the Breydon ditches.
P. STRIGILIS. Sm. Mixed with above species, but rare.
P. FASCIOLA. Sm. River Bure, near Yarmouth, and Breydon ditches—rare.
P. HIPPOCAMPUS. Sm. In most brackish-water localities, but not common.
P. LACUSTRE. Sm. Whissonsett, Poringland, Ormesby—frequent.
P. SPENCERI. Sm. Whissonsett, Ormesby.
P. TRANSVERSALE. Sm. Wells and Hunstanton sands.
P. NORMANII. (Ralfs.) Stomachs of Noctilucæ, Yarmouth.

Genus TOXONIDEA DONKIN.

T. INSIGNIS. Donk. More or less frequent in sand gatherings; Hunstanton, Brancaster, Wells.
T. GREGORIANA. Donk. Associated with the preceding.

Genus Stauroneis Ehrenberg.

S. phænicenteron. Ehr. Fresh-water ponds and streams—common.

S. acuta. (Sm.) Rare—Whissonsett.

S. gracilis. Ehr. Whissonsett, Ormesby.

S. linearis. Ehr. Rare—Whissonsett, Heigham.

S. legumen. (Kütz.) Rare—moss, Osier Car, Heigham.

S. salina. (Sm.) Breydon ditches.

S. cohnii. (Hilse.) Moss, Osier Car, Heigham.

S. spiculum. (Hickie.) Very rare—in a brackish-water ditch at Burgh. This is probably only a delicate state of *Schizonema crucigerum*.

Genus Amphiprora Ehrenberg.

A. alata. (Kütz.) Common in salt and brackish water; very fine in a ditch near Caister.

A. paludosa. (Sm.) Rare—in some of the Breydon ditches.

A. constricta. (Sm.) Abundant in a gathering from the Bure, near Yarmouth.

A. lepidoptera. (Greg.) Hunstanton and Wells sands.

A. elegans. (Greg.) Hunstanton and Wells sands.

A. maxima. (Greg.) Hunstanton and Wells sands—rare.

Genus Colletonema Brébisson.

C. eximium. (Thw.) River Bure; Breydon ditches.

C. vulgare. (Thw.) Breydon ditches.

Genus Schizonema Agardh.

S. crucigerum. (Sm.) Brackish-water ditches, Burgh; Yarmouth, Breydon.

S. grevillii. Ag. Growing on posts of the Britannia Pier, Yarmouth.

Genus Mastogloia.

M. Smithii. (Sm.) Common in the Breydon gatherings.

Genus Stictodesmus Greville.

S. craticula. (Ehr.) Whissonsett, Ormesby.

This form was placed by Ehrenberg, Kützing, and others, in the Genus Surirella; Herr Grunow makes it the type of a new genus (Craticula); Professor H. L. Smith refers it (I think rightly) to, Greville's Stictodesmus.

Family X—BIDDULPHIÆ.

Genus Biddulphia Gray.

B. aurita. (Bréb.) River Nene, Breydon ditches, stomachs of Noctilucæ, Yarmouth.

B. baileyi. (Sm.) Stomachs of Noctilucæ, Yarmouth.

B. radiatus. (Sm.) Breydon ditches—very rare.

B. rhombus. (Sm.) Breydon and Wells—very rare.

Genus Amphitetras Ehrenberg.

A. antediluviana. Ehr. I once detected a valve of this species in a gathering from Cromer, but have never found it since in this county; it is therefore probable that it had accidentally got into this material.

Genus Triceratium Ehrenberg.

T. favus. Ehr. Breydon ditches, mud from Yarmouth Harbour —not frequent.

T. alternans. (Bail.) Breydon ditches, stomachs of Noctilucæ —rare.

T. striolatum. Ehr. Breydon ditches, stomachs of Noctilucæ.

Genus Ditylum Bailey.

D. trigonum. Bail. Stomachs of Noctilucæ, Yarmouth. This form is Mr. Brightwell's *Triceratium undulatum* = *T. brightwellii* (Ralfs). Professor Bailey's generic and specific names have the priority of publication.

Family XI—MELOSIREÆ.

Genus Cyclotella Kützing.

C. operculata. Kütz. Frequent in fresh water.

C. kützingiana. (Thwaites.) Fresh or brackish water; Ormesby Breydon, Flordon, River Bure.

C. minutula. Kütz. Ormesby, Whissonsett, Horning.

C. rotula. Kütz. Ormesby, Breydon.

C. punctata. (Sm.) The Nene, near Wisbeach; Titchwell, Breydon.

C. dallasiana. (Sm.) Very rare—in one of the Breydon ditches.

C. papillosa. (O. Meara.) Rare—in one of the Ormesby gatherings.

C. scotica. Kütz. River Bure, near Yarmouth.

Genus Coscinodiscus Ehrenberg.

C. radiatus. Ehr. Hunstanton sands; stomachs of Noctilucæ, Yarmouth; Breydon—rare.

C. excentricus. Ehr. Same localities as the preceding species.

C. ovalis. (Roper.) Hunstanton sands—frequent.

C. concinnus. (Sm. nec Ehr.) Stomachs of Noctilucæ.

C. minor. (Kütz.) Breydon, Wells, Hunstanton.

C. nitida. (Greg.) Hunstanton sands—rare.

Genus Eupodiscus Ehrenberg.

E. argus. Ehr. Rare—in mud from Yarmouth Harbour.

Genus Auliscus Ehrenberg.

A. sculptus. (Sm.) Rare—Yarmouth Harbour, Breydon.

Genus Actinocyclus Ehrenberg.

A. ralfsii. (Sm.) Stomachs of Noctilucæ, Yarmouth; Hunstanton sands.

A. subtilis. (Greg.) Associated with above species.

Genus ACTINOPTYCHUS EHRENBERG.

A. UNDULATUS. (Kütz.) Stomachs of Noctilucæ, Yarmouth; Breydon ditches, Hunstanton, and Wells.

Genus MELOSIRA AGARDH.

M. VARIANS. Ag. Common—in most fresh-water ditches.
M. BORRERII. (Grev.) Pure in a brackish-water ditch, Breydon.

Genus ORTHOSIRA THWAITES

O. ARENARIA. (Sm.) Frequent in a ditch at Hellesdon, but rare in other localities.
O. ORICHALCEA. (Sm.) Frequent in fresh-water ditches.
O. MARINA. (Sm.) Stomachs of Noctilucæ, Yarmouth.
O. PUNCTATA. (Sm.) Ormesby Broad—rare.

Genus DENDROTERES EHRENBERG.

D. SPIRALIS. (Ehr.) Rare—in moss from an elm on Earlham Road.

Genus PODOSIRA EHRENBERG.

P. MACULATA. (Sm.) Breydon ditches.

Family CHÆTOCEREÆ.

Genus CHÆTOCEROS EHRENBERG.

C. WIGHAMII. (Bri.) In a ditch near "The Berney Arms," Breydon.
C. BACTERIASTRUM. (Wallich.) Stomachs of Noctilucæ, Yarmouth.
C. ARMATUM. (West.) Yarmouth sands: a very doubtful diatom. It may sometimes be found forming a greenish-brown pellicle, on the wet sand, at low water.

Genus RHIZOSOLENIA EHRENBERG.

R. STYLIFORMIS. (Bri.)
R. IMBRICATA. (Bri.)
R. SETIGERA. (Bri.)
R. ALATA. (Bri.)
} Stomachs of Noctilucæ, Yarmouth.

Genus LITHODESMIUM EHRENBERG.

L. (?) MALLEUS. (Bri.) Stomachs of Noctilucæ, Yarmouth. I have placed this form in the above genus, with considerable hesitation; it is probably not Diatomaceous.

Number of Genera 60

Number of Species 264

TRANSACTIONS

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Norfolk and Norwich

NATURALISTS' SOCIETY;

Presented to the Members for

1877–78.

VOL. II.—PART IV.

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Examined and found correct,

W. H. BIDWELL, *Auditor.*

List of the publications received by the Society as Donations or Exchanges from March, 1877, *to March,* 1878.

BROWNE (SIR THOMAS).

Dr. Browne's Correspondence with Dr. Merritt from July 13th, 1668, to (June?) 1669.—An account of Birds found in Norfolk.—An account of Fishes, &c., found in Norfolk, and on the coast. [Extracts from Sir Thomas Browne's Works, edited by Simon Wilkin, F.L.S., 4 vols. 8vo. Vol. i. pp. 393—408, and vol. iv., pp. 313—336]. *London,* 1836

From Mr. H. B. Woodward, F.G.S.

BURRELL (REV. JOHN, A.M., F.L.S., &c.).

A Catalogue of Insects found in Norfolk. [From the Transactions of the Entomological Society of London; *circa,* 1810.] 8vo.

From Mr. J. B. Bridgman.

GURNEY (JOHN HENRY, F.Z.S.).

A Descriptive Catalogue of the Raptorial Birds in the Norfolk and Norwich Museum. Part 1 containing Serpentariidæ, Polyboridæ, Vulturidæ. Roy. 8vo. *London,* 1864

From Mr. Thomas Southwell, F.Z.S.

GURNEY (JOHN HENRY JUN., F.Z.S.).

On the claim of the Pine Grosbeak to be regarded as a British Bird. [Reprinted from 'The Zoologist' for June, 1877.] 8vo.

GURNEY (JOHN HENRY, JUN., F.Z.S.).

On Flamborough Head. [Extract from Rowley's 'Ornithological Miscellany.'] Imp. 4to.

From the Author.

LLANGIRB (J.).

Observations on the Migration of Birds that frequent the sea shores, marshes, and hedges, near King's Lynn, in the county of Norfolk. [The 'Mirror,' No. 156; Aug. 20th, 1825.] 8vo. pp. 2.

From Mr. H. B. Woodward, F.G.S.

LUBBOCK (REV. RICHARD).

Observations on the Fauna of Norfolk, and more particularly on the district of the Broads. 8vo. *Norwich*, 1845

Purchased by the Society.

PAGET (C. J. & JAMES).

Sketch of the Natural History of Yarmouth and its neighbourhood, containing Catalogues of the species of Animals, Birds, Reptiles, Fish, Insects, and Plants, at present known. 8vo. . . . *London*, 1834

Purchased by the Society.

SALMON (JOHN D.).

Notice of the arrival of twenty-nine Migratory Birds in the neighbourhood of Thetford, Norfolk, during the years 1834 and 1835, and the spring of 1836, with observations, &c. 8vo. pp. 10.

From Mr. H. B. Woodward, F.G S.

SHEPPARD (REV. REVETT) and WHITEAR (REV. WILLIAM).

A Catalogue of the Norfolk and Suffolk Birds, with Remarks. [From the Transactions of the Linnean Society, Vol. xv.] 4to. 1825

From Mr. Thomas Southwell, F.Z.S.

BRISTOL.

Proceedings of the Bristol Naturalists' Society. New Series, Vol. ii, part 1. 8vo. . . *Bristol*, 1877

List of Officers and Council, Annual Report, List of Members, and Additions to the Library of the Bristol Naturalists' Society for the years 1876—77. 8vo. *Bristol*, 1876—77

From the Bristol Naturalists' Society.

CARDIFF.

Cardiff Naturalists' Society. Report and Transactions. Vol. viii, 1876. 8vo. . . *Cardiff*, 1877
From the Cardiff Naturalists' Society.

EDINBURGH.

Transactions and Proceedings of the Botanical Society. Vol. xiii, part 1. 8vo. . . *Edinburgh*, 1877

Royal Botanic Garden of Edinburgh, founded in 1670. Report for the year 1876. 8vo.
From the Botanical Society of Edinburgh.

GLASGOW.

Proceedings of the Natural History Society of Glasgow. Vol. iii, part 2. 8vo. . . *Glasgow*, 1877

Transactions of the Glasgow Society of Field Naturalists. Part 5, 1877—78. 8vo. . *Glasgow*, 1877
From the Glasgow Natural History Society.

LEEDS.

The Leeds Naturalists' Club and Scientific Association, 1876—77. The Seventh Annual Report and President's Valedictory Address, &c. 8vo. . *Leeds*, 1877
From the Leeds Naturalists' Club.

LEWES.

The Thirteenth Annual Report of the Lewes and East Sussex Natural History Society. 12mo. . *Lewes*, 1877
From the Lewes Natural History Society.

LIVERPOOL.

Proceedings of the Liverpool Naturalists' Field Club, for the years 1866—67. 8vo. . *Liverpool*, 1877

Notes by a Field-Naturalist in the Western Tropics. From a Journal kept on board the Royal Mersey Steam Yacht "Argo;" by Henry H. Higgins, M.A. Sm. 8vo.
Liverpool, 1877
From the Liverpool Naturalists' Field Club.

LONDON.

Proceedings of the Royal Institution of Great Britain. Vol. viii, parts 3 and 4. 8vo. *London*, 1877—78
From the Royal Institution.

PLYMOUTH.

Annual Report and Transactions of the Plymouth Institution, and Devon and Cornwall Natural History Society. Vol. vi, part 1, 1876—77. 8vo. *Plymouth*, 1877
From the Plymouth Institution.

NEW ZEALAND.

Transactions and Proceedings of the New Zealand Institute, 1876. Edited and published under the Authority of the Board of Governors of the Institute, by James Hector, C.M.G., M.D., Manager. Vol. ix, issued May, 1877. Roy. 8vo. *Wellington*, 1877

Index to Vols. i—viii of the Transactions and Proceedings of the New Zealand Institute. Roy. 8vo.
Wellington, 1877
From the New Zealand Institute.

UNITED STATES OF AMERICA.

Annual Report of the Board of Regents of the Smithsonian Institution, showing the operations, expenditures, and condition of the Institution for the year 1876. 8vo.
Washington, 1877
From the Smithsonian Institution.

Report of the United States Geological Survey of the Territories; by F. V. Hayden, U.S. Geologist in charge. Vol i, Contributions to the Extinct Vertebrate Fauna of the Western Territories; by Professor Joseph Leidy. Vol v, Synopsis of the Acrididæ of North America; by Cyrus Thomas, Ph.D. Vol. ix, A Report on the Invertebrate Cretaceous and Tertiary Fossils of the Upper Missouri Country; by F. B. Meek. Vol. xi, Monographs of North American Rodentia; by Elliott Coues and Joel Asaph Allen. 4to.
Washington, 1873—77

First, Second, and Third Annual Reports of the United States Geological Survey of the Territories for the years 1867, 1868, 1869, under the Department of the Interior. 8vo. . . . *Washington*, 1873

UNITED STATES OF AMERICA.—*(continued)*:

Preliminary Report of the United States Geological Survey of Wyoming, and Portions of contiguous Territories; by F. V. Hayden, U.S. Geologist. 8vo. *Washington*, 1871

Preliminary Report of the United States Geological Survey of Montana and portions of adjacent Territories; being a fifth annual report of progress; by F. V. Hayden; with Supplement, containing the Report on Fossil Flora; by Leo Lesquereux. 8vo. *Washington*, 1872

Annual Report of the United States Geological and Geographical Survey of the Territories, embracing Colorado; being a Report of Progress of the Exploration for the year 1874; by F. V. Hayden. 8vo. . *Washington*, 1876

Ninth Annual Report of the United States Geological and Geographical Survey of the Territories, embracing Colorado, &c.; being a Report of Progress of the Exploration for the year 1875; by F. V. Hayden. 8vo. *Washington*, 1877

Lists of Elevations, principally in that portion of the United States west of the Mississippi River. Fourth Edition, collated and arranged by Henry Gannett, M.E. 8vo. *Washington*, 1877

Meteorological Observations during the year 1872, in Utah, Idaho, and Montana. Prepared for Publication by Henry Gannett. 8vo. . . *Washington*, 1873

Descriptive Catalogue of the Photographs of the United States Geological Survey of the Territories, for the years 1869 to 1875 inclusive; by W. H. Jackson, Photographer. 8vo. . . . *Washington*, 1875

Meteorological Observations made during the year 1873 and the early part of the year 1874, in Colorado and Montana Territories. Prepared for Publication by George B. Chittenden. 8vo. . . *Washington*, 1874

Fur-bearing Animals: a Monograph of North American Mustelidæ; by Captain Elliott Coues. 8vo. . *Washington*, 1877

Ethnography and Philology of the Hidatsa Indians; by Washington Matthews. 8vo. *Washington*, 1877

UNITED STATES OF AMERICA.—*(continued)*:

Bulletin of the United States Geological and Geographical Survey of the Territories. First series, Nos. 1 and 2; Second series, No. 2, 4, 5, and 6; Vol. ii., Nos. 1, 2, 3, and 4; Vol. iii., Nos. 1, 2, 3, and 4. 8vo.
Washington, 1874—77

Bulletin of the United States Entomological Commission, Nos. 1 and 2. 8vo. . *Washington*, 1877

Sketch of the origin and progress of the United States Geological and Geographical Survey of the Territories. F. V. Hayden, U. S., Geologist-in-charge. 8vo.
Washington, 1877

Catalogue of the publications of the U. S. Geological and Geographical Survey of the Territories. F. V. Hayden, Geologist-in-charge. Second edition (revised to Dec. 31st, 1876). 8vo. . . *Washington*, 1877

From Dr. F. V. Hayden, United States Geologist-in-charge.

WATFORD.

Transactions of the Watford Natural History Society and Hertfordshire Field Club. Vol. i., parts 6—8. 8vo.
Watford, 1877

From the Watford Natural History Society.

ADDRESS.

Read by the President, MR. F. W. HARMER, F.G.S., *to the Members of the Norfolk and Norwich Naturalists' Society at their Ninth Annual Meeting, held at the Norfolk and Norwich Museum, March 26th, 1878.*

LADIES AND GENTLEMEN—It is now nine years since the Society over which, through your kindness, I have had the honour during the past year of presiding, first originated. I do not think it has disappointed the hopes of its promoters, or failed in the work for which it was constituted. We owe it to our excellent Secretary to acknowledge that both its past success and its present vitality are mainly due to his untiring energy. In the new set of rules which have been submitted to you to-night for adoption, the 29th provides for the dissolution of the Society, should such a step become necessary; but this clause will certainly remain a dead letter while we retain the invaluable services of Mr. Southwell.

During the year which has now closed we have added considerably to the number of our members. I am glad to be able to say also, that the interest of our meetings has been well sustained, and the papers submitted to us have been fully equal to those of former years. The compilation of an accurate list of the Fauna and Flora of our county has made progress. We have had contributed towards this end two communications, both entomological; a list of the Norfolk Hymenoptera by our Vice-President, Mr. Bridgman, and one of the Hemiptera by Mr. Edwards, whose name for the first time appears in our publications. I must congratulate this gentleman on his having undertaken the study of this interesting branch of entomology, and in doing so I would express the hope, that the example he has set, may be followed by some other of our younger members. It is far more interesting to take up some

neglected branch of natural history, than, as is more commonly the case, one to which the attention of others has been long given. Such a subject has been sketched out for us this year in a paper 'On the Study of Diptera,' by one of our members, Mr. R. H. Meade, of Bradford, which want of space alone prevents us from printing in our Transactions. The publication of Mr. Bridgman's list is also unavoidably postponed until next year.

Professor Newton has sent us a number of interesting letters on ornithological subjects, written by Norfolk Naturalists who are now deceased, to which Mr. Stevenson and Mrs. Lubbock have added others. It is one of the legitimate objects of this Society to rescue from oblivion the names and the works of our predecessors. At our January meeting, Mr. Kitton gave us a most interesting memoir, constructed from material which fortunately came under his appreciative notice, of Wm. Arderon, who resided in this city from 1724 to 1767, in which latter year he died, being buried in the old church at Heigham. He was a Fellow of the Royal Society, and not only a most painstaking naturalist, but a man who, on many subjects, held opinions far advanced on those then current. Our thanks are due to Mr. Kitton for having reminded us of the existence and the labours of our well-nigh forgotten fellow-citizen.

Professor Babington has sent us a list of plants observed by him near Cromer in the years 1875 and 1876. It is to be feared that the opening of the new railway, however desirable on other accounts, may lead to the extermination of some of our rarer plants, and so give this list, a few years hence, a sorrowful interest to botanists.

We publish this year as usual the notes of our well-known ornithologist Mr. Stevenson, and the Weather Report by Mr. Quinton, the Secretary of the Norwich Meteorological Society, also some notes on Norfolk mammalia, by Mr. Frank Norgate of Sparham. Those who remember the paper which that gentleman favoured us with some time since, will welcome another communication from one whose opportunities and leisure are fortunately associated with much practical knowledge of Natural History.

Of the papers submitted to us which we do not publish, one of the most interesting was by Mr. H. D. Geldart, on the structure and fructification of marine algæ, a subject on which he is well qualified to speak, and another by the same gentleman on crustacea, in which he gave us a detailed account of two species of opossum-shrimps, the hearing organs of which are situated in the swimming flaps of their tails. He noticed a fact which does not seem to have been previously recorded, that the pink Yarmouth shrimp *(Pandalus annulicornis)* is luminous for the few minutes that it lives after being taken from the water, the eyes and eye-stalks glowing with phosphorescent light of an orange-coloured hue.

Mr. Hy. Norton contributed to our May meeting an interesting paper on *Hydrobia marginata* as a geological test of climate. Two forms of these minute shells are described by Moquin-Tandon, under the name of *Bythinella marginata* and *Bythinella gibba.* The former has too many whorls for identification with the shell of the Mundesley river bed; but Moquin-Tandon gives two varieties of *B. gibba*, one of which is also called *marginata*, with a single ridge,—and another, *aplexa*, with none; and with these two varieties the Mundesley shell agrees—generally having no ridges, but occasionally having one; although these varieties are referred to the South, the type shell (*gibba*) has been found in the most northerly department; his *B. marginata* is found in the Jura; and Mr. Norton points out that even in the southern departments, the favourite habitat of these shells is at the sources of mountain streams, where the winter cold is probably quite as severe as that of our own country.

In September Mr. Corder gave us an interesting account of his visit to the Engadine from a naturalist's point of view. I would express the hope, that other members of this Society would in like manner favour us with any scientific notes which they may hereafter be able to make, during their various excursions of business or pleasure.

At our November meeting an unpublished lecture by the late Rev. R. Lubbock, whose 'Fauna of Norfolk' is so well known, was read, in which the changes which have taken place in the zoology

of Britain since the Roman occupation of the country, were commented on. It is to be regretted that we are unable to publish this paper, which Mrs. Lubbock has kindly placed at our disposal, but an abstract of it is preserved in our minutes for the use of those who may wish to refer to it.

Three excursions have been made this year: the first on June 12th, to Buxton and Oxnead; the second to Cromer, on July 10th; and the last on the 6th of August, to Somerleyton. Want of space prevents more than a passing allusion to this important part of the operations of our Society: but I would express the thanks which are due from us to Mr. Gambling, who kindly took charge of the first excursion; to Lady Crossley for the permission she granted us to visit Somerleyton; and to Mr. Muncaster who rendered us valuable service on the occasion of our visit to that place. The beauty of the famous winter garden at Somerleyton, and of the grounds for which horticultural art has done so much, were greatly admired, but a still greater interest was excited by the unadorned loveliness of that charming spot, Wicker Well.

Efforts have been made for some years past to arrange an amalgamation between the Geological Society of Norwich and our own. It has been felt by some, that such a course would tend to the strength and prosperity of both bodies, that the introduction of papers on local geology would increase the value of our published Transactions, while their wide circulation would give a greater publicity to the proceedings of our sister society than it has hitherto enjoyed. These negotiations have not at present been attended with success, but possibly at some future time, this object, which seems to me for many reasons desirable, may be attained.

Perhaps I may be allowed on behalf of our Society, to offer a word of welcome to the officers of H. M. Geological Survey, who have now fairly taken in hand the investigation of East Anglia. In some respects it has been unfortunate that their advent has been so long delayed, but on the other hand there has been this compensating advantage, that being thrown entirely on their own resources, local students of geological science have been compelled to grapple with our intricate and puzzling deposits in a more

thorough and systematic way than they would probably have otherwise done. I think it is a matter of which Eastern counties geologists may fairly be proud, that the general succession of the different beds of East Anglia has been worked out and established, that the greater part of the district has been mapped, and that the different fossiliferous deposits have been so industriously worked, that, with the exception of that of the chalk, which is still almost untouched, it is most unlikely that the geological fauna of the East of England will ever be largely added to. No doubt the gentlemen who are now engaged in the survey will discover errors of detail, and bring to light many facts which have hitherto escaped notice; but we may, I think, express the hope, that the main features of the work that has been accomplished will stand the test of their friendly although vigilant scrutiny. Among those who have laboured to bring about such gratifying results, Mr. S. V. Wood, junior, will always take the first place. To that geologist mainly belongs the credit of having established the succession of the glacial and post-glacial beds of the East of England. His name will always be associated with the stratigraphy of our district, as his father's will be with the molluscan fauna of the upper tertiaries, and that of our fellow-citizen Mr. Gunn, with the mammalia of the Cromer beds.

The south-western portion of Norfolk and the north-western part of Suffolk have not received that systematic attention from Eastern counties geologists which has been given to other portions of the district, and it has thus been left to Mr. Skertchly, who has been for some time working in the neighbourhood of Brandon, to bring to light facts bearing on what is by far the most interesting point ever raised by the geological investigation of East Anglia, viz., the period at which man first made his appearance in Britain.

Most of us are old enough to remember the time when it was universally believed that the first progenitors of mankind commenced their existence about 6000 years ago. Evidence was brought forward at the beginning of the present century, which pointed in the direction of a more extended chronology; but it was then received, not so much with incredulity, as with absolute indifference,

and it is only about 20 years since that the subject first began to receive the attention which its great importance deserved. The results which pre-historic archæology has succeeded during the last few years in establishing, are familiar to every one. It has been proved that whereas the inhabitants of Britain were acquainted, at the time of the Roman invasion, with the manufacture of iron, at a previous period they constructed their tools and weapons of bronze, and at a period earlier still were altogether unacquainted with the use of metals. The premetallic age in Europe has further been divided into the neolithic and palæolithic periods, the first characterized by the use of polished stone implements, and the latter by that of implements which were merely roughly chipped into shape.

The ages of iron, of bronze, and of polished stone, have been shown to be all of them more or less connected with the present state of things, for the animals which co-existed with neolithic man were all of them of existing species, and the physical features of the country did not then widely differ from those of our own times.

On the other hand, in considering the age of palæolithic man, archæologists suddenly found themselves landed at a point not only far removed from that of our own epoch, but also from that of the neolithic period. The era of polished stone, distant although it undoubtedly was, belonged to pre-historical, that of the ruder weapons, to geological times. The one was separated, *longo intervallo*, from the other, and there was nothing to show how the transition between them was effected. Still the influence of preconceived ideas was so strong, that it was until quite recently believed that palæolithic man belonged to the later part of the post-glacial period. The feeling has been lately growing up in several directions at once, that the evidence for this was by no means satisfactory. Although the great majority of archæologists still continued to hold to the late post-glacial age of all the earliest remains of man in England, there were some, amongst whom I may mention Dr. Jas. Geikie, Mr. Tiddeman, Mr. Belt, and Mr. Skertchly, who believed that some at least of the implement-bearing beds belonged to interglacial times.

The systematic survey of the Brandon district brought to the

knowledge of the last-named gentleman the existence of a series of deposits, principally composed of brickearth, which he could not assign to any recognized geological horizon, but which seemed to him all of the same age, and which he has called the Brandon beds. Mr. Skertchly says that although these deposits occur in a district from the greater part of which the chalky boulder clay has been denuded, they are never found except in association with an outlying fragment of that formation, which sometimes overlies, and at other times underlies them. His investigations have further led him to the belief that these beds are the oldest yet known from which palæolithic implements have been obtained, and that they undoubtedly belong to some part of the glacial series. In November, 1876, he communicated to the members of the Norwich Geological Society, the facts by which his views were at that time supported; but they were not so thoroughly convincing as could have been desired, seeing that the *onus probandi* rested on those who claimed a higher antiquity for man than had been otherwise established. He has recently met with facts bearing on the same subject, which a few days ago he communicated to several members of this Society, but which are not at present generally known. At Warren Lodge, about two miles from Mildenhall, are some brickearths, which have been long known as having furnished to archæologists many specimens of unpolished implements, some of them of the rudest type. Mr. Skertchly has found that in more than one clear vertical exposure these brickearths are overlaid by several feet of undisturbed, tough, chalky boulder clay, which in a large pit at a short distance is shown in section 25 feet in thickness. Unfortunately the evidence is still encompassed with some amount of perplexity, as he has since ascertained by digging that these brickearths also rest on boulder clay, so that they look as if they were wedged into a mass of that deposit. Taken as a whole, however, the general evidence in support of Mr. Skertchly's contention that these Brandon beds are of interglacial age, which it would be impossible to give in detail here, is, in my opinion, of considerable weight. If his views are correct, it relegates the first appearance of man in Britain to a point much further removed from our own

times than is that nevertheless distant epoch to which we have hitherto referred it.

Starting from entirely different premises, Mr. Searles V. Wood, junior,* has recently reached a conclusion with regard to the implement-bearing beds at Hoxne, which are so well known from Professor Prestwich's memoirs in the 'Philosophical Transactions,' which is somewhat parallel to that of Mr. Skertchly. These fresh-water deposits at Hoxne are described by Professor Prestwich as resting in a hollow of the boulder clay, near a small lateral branch of the valley through which the Waveney and Little Ouse rivers flow. They are situated on high land, 50 feet above the present level of the Waveney, and about half a mile from the southern brow of the valley. It was almost impossible to suppose that a fresh-water lake could occupy such a position, if the physical features of the country were the same as at present; and this fact, and the occurrence of patches of gravel near to the edge of the high land bordering the valley, led Mr. Prestwich to conclude that the river Waveney at that time flowed at a much higher level, and had since excavated its valley to its present depth. This view has been opposed by the late Mr. J. W. Flower, Mr. Wood, and others, on the ground that the physical features of the district are inconsistent with such an hypothesis. The valley in which the Waveney flows is a continuous gorge of pretty even width, extending from the fen country to the German Ocean. At Lopham ford, about half way from each end, and at a point where the valley is nearly as wide and deep as it is elsewhere, two streams take their rise in a stagnant marsh, one the Little Ouse, flowing westwards, and the other the Waveney, flowing to the east. It seems hardly possible that two streams could cut away and level down their joint watershed so completely as they must have done if Mr. Prestwich's theory be correct.† Indeed the real bottom of the valley at this

* Mr. Belt has also, although on different grounds, urged the interglacial, if not preglacial, age of the Hoxne brickearth.—*Quart. Journ. Science*, July, 1876.

† For a fuller account of Mr. Wood's views, see *Geological Magazine* for December 1877, p. 550.

point is probably much deeper than the present level of the marsh where the two streams take their rise, being hidden by the alluvium of which this marsh forms the surface.

The study of the glacial beds of this district has led Mr. Wood to conclude, that at some time during the glacial period, the greater part of East Anglia over which the boulder clay had been deposited was converted into land, and that the Waveney valley was filled by a tongue of ice, given off from the extremity of that portion of the great glacial ice sheet which moved down from the high land of Yorkshire, through Lincolnshire, and which extremity rested, as he believes, in the valley of the fens. Mr. Wood maintains that the filling up of the Waveney valley by a tongue of ice in this way, permitted of the existence of a small glacier lake, similar to the Märgelen sea in Switzerland, in the position of the Hoxne bed, and the waters of this lake afterwards escaping as the glacier ice began to melt, caused the excavation of the small lateral valley of the Goldbrook, which cuts through one side of the palæolithic bed, and enters the Waveney valley at right angles near the village of Hoxne. This theory, which claims for the Hoxne deposit an age intermediate between that of the first-formed portion of the chalky boulder clay, and that which rests on glaciated chalk in some of our valley bottoms, is I think worthy of consideration in connection with the facts discovered by Mr. Skertchly.

Dr. James Geikie had also, previously to the announcement of Mr. Skertchly's views, advocated in his 'Great Ice Age,' the opinions held by himself and other geologists, that the age of palæolithic man was interglacial. He has pointed out that although certain extinct mammalia at one time inhabited the northern parts of England, as proved by the occurrence of their fossil remains in cave deposits, such remains are not met with in the unquestionably post-glacial river gravels of that part of the country. The valley deposits in which palæolithic implements and the bones of these extinct mammalia are found, are confined to the south-eastern part of the British Isles, and Dr. Geikie argues that their absence from similar beds in other parts of the country is due to the fact that all traces of them have been there removed by the last advance of the

ice, which last advance we have no reason to believe extended beyond the upland districts. On the other hand, he points out that the polished neolithic implements, which are altogether of later age than the period of arctic cold, are found everywhere in the British Isles, from Caithness to Cornwall, and from Norfolk to the west coast of Ireland.

The age of the palæolithic remains found in caverns, together with the cave bear, machairodus, and other ancient forms, although evidently of great antiquity, as proved not only by the consideration that the deposition of the different beds of cave earth and stalagmite must have taken a very long period, but also by the fact that some of these deposits could only have originated under physical conditions widely different from those which now obtain, were generally regarded as of post-glacial age.

The investigation, however, of an ossiferous cavern near Settle in Yorkshire, has for some time induced Mr. Tiddeman and others to doubt this view, which was held, not so much on account of the evidence which could be adduced in its favour, as on account of the conscientious determination of archæologists to extend their ideas of man's antiquity only in accordance with undoubted proof. In the Victoria cave at Settle, Mr. Tiddeman had found the remains of the *Elephas antiquus*, the *Elephas primigenius*, the hippopotamus, two species of rhinoceros, two species of bear, etc., and associated with them a fibula which was believed to be human. The deposit containing these remains is overlain, as I myself have seen, at the mouth of the cave, by unstratified glacial clay. The influence of the deeply rooted belief that primeval man was of late post-glacial age, has caused geologists to doubt both that the fibula was human, and that the clay was *in situ*. I cannot express any opinion on the first point, but I think that the evidence for the second would have been thought sufficient, had it not been for the reason I have given. However this may be, the fact which Mr. Tiddeman urges, that no remains of these extinct mammalia are found in the valley deposits of the neighbourhood, while they are present in the cavern, is in favour of the theory of their being older than the last period during which the valley was filled by ice.

The fact that man co-existed in Britain, and as far south as the south of France, with the reindeer and musk ox, which animals are now confined to arctic regions, seems to carry us back to times in which the cold of the 'Great Ice Age,' still continued. We are perhaps hardly justified by the present evidence in asserting that the existence of palæolithic man in glacial times is proved beyond question, but the considerations I have laid before you seem to me at least to point strongly in that direction.

It must not be forgotten, that although we have traced primeval man in Britain to an exceedingly distant epoch, for such a position has been unquestionably established, quite apart from the views of those who believe in interglacial man, we have by no means followed back the stream of archæological history to its source. There is no reason whatever to suppose that the first progenitors of mankind lived in Britain. The savages who originally visited these regions came as immigrants, driven no doubt from temperate climes to the then inhospitable regions of the north, by the pressure of stronger races. Ethnology would lead us to suppose that primeval man lived in a continent extending from northern Africa to India, and across the Bay of Bengal to New Guinea, the greater part of the central portion of which is now submerged, and this may have taken place as far back as the miocene period. It will not therefore surprise us, if when the same careful investigation comes to be applied to the continents of Europe, Asia, and Africa, which has been given to the small area of England, the birthplace of stratigraphical geology, evidence should be forthcoming which will enable us to carry man's antiquity much further back than we can do at present. He would not be a very rash prophet, I think, who foretold the discovery of such evidence.

Our belief in the antiquity of man, by no means, however, rests on the unsupported evidence of archæology. The sciences of ethnology, of philology, and as some think of history also, bear similar testimony, with one voice telling us that the advent of the human race took place at a period which is too far removed from our own to be estimated by our historical methods.

It is worthy of remark, that as far as those portions of the

earth's surface are concerned, which have received anything like thorough investigation, the earliest races of man were altogether uncivilized. The fact that rude though spirited drawings of the reindeer, and the mammoth, have been found in the Dordogne caves in the south of France, unquestionably the productions of palæolithic men, is not inconsistent with the belief in their uncivilized condition, for the curious fact has recently been noticed by Professor Fritsch that the Bushmen, who are probably the most degraded of mankind, have a considerable amount of artistic skill, including a knowledge of perspective.

Carrying our thoughts still further backward, we are confronted with the question of the possible ancestry of primeval man. When Mr. Darwin published in 1859 the 'Origin of Species,' although he only incidentally alluded to the subject, it was felt and urged by objectors to the theory of evolution, that were its truth established, as far as the various lower forms of animal and vegetable life were concerned, it would be next to impossible to suppose that the case of man was an exception to the rule, and it was to this belief that the violent opposition which the Darwinian theory encountered may probably be assigned. It is difficult, I think, to withstand the force of this argument. So long as the views of creation which were formerly in vogue were held to apply, not only to organic life, but to the earth itself, and even to the different bodies of the solar system, so long could the belief that man sprung suddenly into existence at the word of the Creator be logically held, but now that Science has given us its grand conception of the Reign of Law—which indeed does not supersede the idea of a Supreme Being, but to a large proportion of scientific thinkers necessitates that belief—now that we are able to understand much of the way in which creation has been carried on, learning, for example, from geology, what have certainly been the processes by which the surface of the earth has acquired its present condition, and from other branches of physical science what has probably been the genesis of the heavenly bodies; now that the idea of evolution is not only shown to be true in physical, but to be also an integral part even of mental and moral science, in

which it is every day becoming clearer that the present is most intimately connected with, and springs from, the past; and if it is now further established that all organic life has similarly originated, it will be more and more difficult to believe that man alone, of all that portion of creation with which we are acquainted, is the exception to this otherwise universal reign of law.

The arguments in support of the theory which bears the name of Mr. Darwin are well known, and are admittedly of great weight. Those which have been urged against it are principally of the nature of objections, but as Professor Huxley has remarked, with reference to this very point, there are two kinds of objection, that of which it may not be at first sight easy to find the explanation, and that which knocks one down altogether, and the arguments against evolution are, I take it, all of the first class. The old saying that "possession is nine points of the law" may be fairly applied to this controversy. If evolution, as at present understood, had been the old-established belief, and the hypothesis had been advanced that the progenitors of each species had come into existence by means of a sudden act of creation, the difficulties which the advocates of the latter could have urged against the old views would certainly never have been of sufficient weight to have overthrown them—I question, indeed, whether they would have been even listened to—while of the kinds of positive evidence by which the old views were supported, the new theory would have been able to adduce absolutely nothing. The improbability of the supposition that any individual organism ever came supernaturally into existence, would under the circumstances I am imagining, have been an insuperable objection to the general acceptance of its truth.

It would be, of course, unscientific to argue that the creation of new species can only have taken place in conformity with those laws with which we are at present acquainted; but those who assert, as does the writer I am about to mention, that evolution is hypothetical, should remember that that epithet is even more applicable to their own position, and also that the burden of proof rests rather with its opponents than with its advocates, with those who assert that creation has taken place in opposition to, rather

than in conformity with, the ordinary method. Dr. Virchow has recently protested against the *ex cathedrâ* teaching of evolution. I am willing to some extent to admit the justice of his protest; but I cannot allow that the alternative hypothesis, and there is only one other hypothesis possible, should be looked upon and taught as unquestionably true, merely because in the childhood of science it was so regarded.

But it is urged that there are special objections to evolution in the case of man. One such has recently been advanced by a wellknown physician in this city, in a work published during the past year.* While acknowledging the value of the author's researches into the subject of cerebral disease, I regret that I am altogether unable to admit the force of his argument as against the theories of Mr. Darwin.

I anticipate, *in limine*, the criticism, in the larger circle to which unfortunately my remarks may possibly come, that the time has passed when it is necessary to reply to attacks on evolution. Whatever may be the case elsewhere, or even among my present audience, the publication and endorsement of the book I have referred to, by two such representative men as those whose names are associated with it, justify me, I think, in the name of this Society, in attempting to traverse arguments that otherwise, to a large number of our fellow-citizens, might appear unanswerable.

Dr. Bateman urges first, that speech is a distinctive and universal attribute of man. This proposition that men can and apes cannot speak does not seem to me either startling or new, and I think hardly deserves the labour which has been bestowed on the proof of it. He might have added, *nemine contradicente*, that the former can calculate, and express ideas by writing, pictorially or otherwise, and play games of skill, and construct tools, and the latter cannot. The enormous mental difference between man and the rest of creation is universally admitted. The fact, however, that two places are separated by an immense distance, or by what seems, at first sight, an impassable barrier, is not sufficient to prove that there cannot possibly be a road from one to the other.

* *Darwinism tested by Language*, by F. Bateman, M.D., with a preface by the Dean of Norwich.

His second proposition, on the other hand, that the faculty of speech is *immaterial*, requires vastly more evidence to establish it than has been adduced. The truth of the second proposition certainly does not follow from the acceptance of the first, as the same argument, if I mistake not, would establish the immateriality of man's powers of calculating, or of playing chess.

Even were the immateriality of articulate language proved, however, it does not seriously affect the question of the origin of the human race. It is surely quite as conceivable that this faculty of speech was bestowed upon, if not acquired by some pre-existing form, as that some other form was by a special act of creation called into existence to receive it. A belief in the immateriality of the soul is not in any way affected by the fact that each infant who enters the world does so, not in opposition to, but in conformity with, the reign of law.

The power of articulating, as Dr. Bateman says, is evidently not immaterial, for parrots can talk, and it has not only been found possible to construct the telephone, by which messages are carried to a distance and exactly reproduced by a magnetic current, but also that most extraordinary machine, the talking phonograph, which by purely mechanical means causes a disc of iron to vibrate, and to utter articulate words. Articulate speech, thus shown to be as simply a mechanical act as the production of a musical sound, is an instrument used by man for conveying his ideas to his fellows, a much more perfect one indeed than that of the bird who by different notes communicates with its mate, but they are both of them instruments, and there is not so much difference between them as there is between that which they are the means of expressing. The difference between man and other animals is thus not so much the being able to use articulate speech, as that the former possesses so much more reason than the latter, that he can associate words with ideas, which they are unable to do. A savage placed in the laboratory of a physicist would be unable to perform the simplest experiment. A parrot taught to speak can make no practical use of its acquirement.

It is somewhat difficult to understand exactly what Dr. Bateman

means by the immateriality of speech. If he merely maintains that the utterance of language is the mechanical expression of immaterial thought, I fail to see what connection his published researches into the non-localization of speech in the third left frontal convolution of the brain, (which he asserts form "a powerful and original argument against the dangerous heresy of Darwinism") have to do with the subject, but the expression he makes use of in p. 181, that speech like the soul is probably an attribute, an immaterial "*nescio quid*," is hardly consistent with such a view. We may agree with him that a comprehension of the origin of language is beyond the limits of our present knowledge, but he must produce a somewhat stronger argument than "*nescio quid*" to establish his position of the immateriality of speech. He says, in effect, "I do not believe that primeval man learned to speak by any natural process, because I cannot understand how such process could have taken place," but to prove the fallacy of Darwinism, he should show, not that such an origin seems to him unlikely, but that it is incredible, which it would not be easy to do. He claims, however, to have established that the views of Professor Broca and others, who assert that the faculty of speech is located in a certain part of the brain, are erroneous. Granting, for the sake of argument, that Professor Broca is wrong,* in what way does that prove that Dr. Bateman is right? The overthrow of his opponent's views may possibly clear the way for a discussion of his own, but his adversaries being vanquished, he must bring forward some real arguments in support of his position that speech is immaterial, and these I have looked for in vain. If the theory of the localization of speech were one of the main supports on which Darwinism rested, its destruction would weaken that which had been built upon it; but this is not the case, and it matters therefore little to evolutionists whether it be true or not. The immateriality of speech, and its localization in a certain part of the brain, are not the only two possible explanations of the matter.

* In a recent review of Dr. Bateman's book in *Brain*, the editor, Dr. Bucknill, does not admit that this is at all satisfactorily made out.

Although the physical connection between man and the anthropoids is admittedly so close, intellectually the gap between them is immense; but this has never been denied, and the force of Mr. Darwin's argument remains, that granting this, man's mental and even moral attributes are present in a feeble and undeveloped condition in the lower animals; it is not only man's bodily frame that bears a family likeness to that of the rest of creation; animals not only possess in a rudimentary form the various mental emotions and faculties which are in a higher degree characteristic of man, but the reverse of this also obtains, for there is no animal instinct or passion which is not also characteristic of man. When we reflect that, even in the nineteenth century, international disputes are, as a rule, settled by the brutal arbitrament of war, it is difficult to escape the conclusion, that notwithstanding the ameliorating influence of ages of civilization and religion, man still retains very strong evidence indeed of his animal origin.

I can but just allude in passing to the question which has often been put in this city, and which Dr. Bateman again asks: Why are not the fossil skeletons forthcoming of the missing links between man and his supposed ancestors? But I would remark that this objection is not urged by those who practically know how excessively fragmentary the geological record is, and how rarely even in modern deposits are the bones of man and of recent mammalia preserved. Let me remind you that of all the numerous inhabitants of Great Britain during the early stone period, only one doubtful bone has ever been met with, yet who would argue there were no palæolithic men, because we cannot find their skeletons?

Take another case: the various European races of the Indo-Germanic family, on the one hand, and the Hindoos and Persians on the other, are doubtless descended from a common ancestry, but this cannot be proved by fossil evidence, and the absence of proof of this kind has never been brought forward as any difficulty in the way of such a belief. It is not only the parentage of these races of men that cannot thus be proved; a similar remark may be made respecting the languages spoken by them. There is no

documentary evidence to show the process by which the Sanscrit and Latin tongues originally grew out of the primeval Aryan speech, nor is there, in fact, the slightest direct proof of the existence of the Aryan language, yet no one doubts either the one position or the other; and the philologist as little thinks of urging that the absence of records written in the Aryan tongue casts any doubt on the question of its former existence, as the geologist wonders at the non-production of the skeletons of the men who spoke it. It must be remembered that the evidence upon which the common origin of the group of languages I have referred to rests, is far inferior to that in favour of "the descent of man;" for in the former case, it consists of the fact that a few words and grammatical forms are the same in the different tongues, whereas in the latter, it is not only that some organs are common to man and his nearest allies, but that there is between them an almost absolute identity of structure.

The science of philology, showing as it does, that languages have grown by slow and insensible degrees, that they can be classified by a natural system of relationship, just as species and genera in the organic world (the only scientific explanation of which is the theory of their relationship by descent from common ancestors) rather confirms than opposes the Darwinian hypothesis, showing that language has not been exempt from the operation of the great law of evolution.

Can it be denied, however, that the aboriginal races of the world (as they are called), such as the native Australian, are intermediate forms between the Aryan or Semitic nations and apes? Similarly, the present inhabitants of England are certainly less nearly connected with the anthropoids, physically, mentally, and morally, than were the rude savages who co-existed here ages ago with the mammoth.

The contention that language is the exclusive attribute of man, and that we cannot conceive that he acquired it by any natural process, is, at the most, but one of those inconclusive arguments which Professor Huxley puts in his first category, and I do not

think that a chance objection* like this, brought forward without a single attempt to combat or explain away the weighty arguments by means of which the theories of Mr. Darwin have acquired their present hold over the scientific world, will, to those who seriously weigh those arguments against this objection, "show the fallacy of Darwinism." Dr. Bateman seems, however, to feel the unsatisfactory nature of his own position, for at p. 224 he remarks, "The same Power that planned the glorious temple of Nature could easily have caused us to pass through the probationary stages of ascidian, fish, reptile, and monkey, and so on to man, if it had so willed it." Admitting, as it seems to me by these words, that there is no inherent impossibility in evolution, and consequently, that there is little value in his own objection to it, he falls back on his original position—that Darwinism is a dangerous heresy, and is inconsistent with revelation.†

This supposed irreconcilability of Science and Scripture is still, as I believe it always has been, the great obstacle to the acceptance of the belief, both of the derivative origin, and the antiquity of man.

In the name of Science I protest against the position, that the Scriptures are the exclusive property of one school of religious thought. The Bible is the heritage of all mankind, and those who have opposed from time to time the teachings of Science, on the ground of their irreconcilability with revelation, so far from being the only defenders of Scripture, have, I maintain, been rather its enemies. The hold which the Bible has had, and always will have, on mankind, arises, from its revelation of moral and religious

* It is proverbial that Mr. Darwin, with a candour unfortunately too rare, urges almost every possible argument against his own theory; but although he alludes to the question of articulate language, he evidently regards it as by no means a serious objection to his position.

† I am glad to be able to agree with Dr. Bateman's remark, that natural religion offers no objection to the evolution theory, although his contention that revealed religion does so, seems almost to suggest the possibility of there being something unnatural in the interpretation of the latter which necessitates such a position.

truth. We bow before these ancient writings, because they speak to our hearts of faith in God, of duty towards our fellow men, and of the final triumph of righteousness. Those who claim for them a miraculous inspiration in matters of chronology, of history, and of physical science, advance pretensions never claimed by the books themselves, by no means uniformly asserted by theologians, and certainly repudiated by many of the more intelligent believers of the age.

It is difficult to understand, why the history of the long conflict between religion and science has not taught those theologians who are still fighting in the same cause, the danger of their position. They have no right to forget, on the one hand, that science has never been driven from one position which it has won from theology, or on the other, that the damage which the interests of religion have sustained in the conflict have been incalculable. In this controversy—which will most assuredly be eventually decided on purely scientific grounds, and without reference to the position of theologians—to argue that the truth of religion depends upon, or is in the slightest degree connected with the results of such controversy, seems to me in the highest degree unwise and dangerous, especially as the position may, according to the admission of those who so argue, be any day rendered untenable.

Science and Theology may be compared to two companies of engineers, who are engaged in constructing a tunnel starting from opposite sides of a mountain. If such work be correctly performed, it must inevitably meet in the middle, and the fact that it did not so meet could only be attributed to one cause, namely, some error on the part, possibly of both companies, which had led them wrong. Theology working from the verities of religion, and science starting from the facts of nature ought to have met, if the processes which they had followed had been correct. Whether we look at the past or contemplate the present, we must, I think, confess that such has not been the case. Instead of the light which should by this time have been apparent through the tunnel, both portions have passed each other, and both are as it seems to me getting

further from their junction. On the one hand we find science, in the hands of its extreme adherents, pushing on into the darkness of materialism, on the other we find theology, as represented at least by one school of thought, working along the line of a hard and mechanical theory of inspiration, finding itself further and further from the positions of modern science. I do not for one moment believe, that light will ever illuminate mankind through those whose work is leading in the direction of materialism. I cannot doubt but that there must be some unsuspected element of error in the reasoning which would lead to such a result. On the other hand it would be treason to truth, if from any fear of unpopularity or offence, I were to hide from you my conviction, that the prospect of reconciliation along the line of a literalistic interpretation of those parts of Scripture which deal with scientific subjects, becomes more and more improbable. The past controversies between the book of Genesis and science were never really settled, they have been rather forgotten in the presence of newer and more urgent difficulties. It is not to be wondered at, that the geological controversies are lost sight of in the presence of the far greater difficulties to literalistic views raised by the certainty of the antiquity and the possibility of the descent of man. The fact, however, of this increasing divergence seems to me a reason why theology should hesitate still to entrench itself behind the *non possumus* of the infallibility of its interpretation of Scripture, rather setting itself to search whether there may not have been also in its processes some error which has led it astray.

In conclusion, the light which science throws on the past history of our race seems to me a prophecy of hope for the future. In pre-historic times, during the palæolithic, the neolithic, and the bronze periods, we can trace a distinct progress in those matters which tend to raise man above the rest of creation. The same thing is unmistakeably evidenced by history; although its pages are often darkened by retrogression, by relapses into barbarism, although the progress of civilization has been far from uninterrupted, yet progress has undoubtedly been made. And as regards

that which pre-eminently raises man above animals, giving him the control of those passions which he shares with them, his mental, moral, and religious nature, I read history wrongly if in this also there has not been a slow but certain advance. If there be any meaning in all this, the conclusion forces itself upon us, that not only shall man in the future gain a still greater control over the forces of nature, and obtain a profounder knowledge of her secrets, but shall also advance in all that most truly widens the breach between him and the brutes, and raises him towards the great Source and Centre of good. Inspired writers have taught us to look for the establishment of the kingdom of heaven, and in this teaching at least there is no divergence between Science and Scripture.

I.

TELLINA BALTHICA AND THE NORWICH CRAG.

By F. W. Harmer, F.G.S.

Read 26th June, 1877.

In 1865, in his 'Remarks in explanation of the Map of the Upper Tertiaries of the Eastern Counties,' which were not published, but printed and distributed privately, Mr. Searles V. Wood, jun. disputed the identity of the so-called crag at Weybourne, on the North Norfolk coast, with the fluvio-marine crag of Bramerton (which identity had been up to that time generally assumed), principally on the ground that the former deposit contained very abundantly a shell, *Tellina balthica* (*solidula*), the occurrence of which in the latter had never been authenticated. Since then, further investigation has shown the existence of a number of exposures, in what Mr. Wood and I have called the Bure Valley Beds, or Lower Glacial Pebbly Sands, at Belaugh, Crostwick, and elsewhere, between Norwich and Weybourne, of a fossiliferous horizon, containing a similar group of shells to that of the Weybourne deposit, *Tellina balthica* always being the most abundant species. These beds we associate, on stratigraphical as well as on palæontological grounds, with the glacial series, maintaining their separation everywhere from the crag deposits. These Bure Valley Beds have subsequently been described by Mr. Prestwich, and called by that gentleman the Westleton Shingle, though some doubt has been raised by the officers of H. M. Geological Survey, whether what Mr. Wood and I regard as the Bure Valley Beds do actually occur at Westleton. These pebbly sands underly and are interbedded with the Cromer till along the North Norfolk coast, and we have not been able to observe any unconformity between the two deposits.

In the late Dr. S. P. Woodward's list of the shells of the Norwich crag, *Tellina balthica* is given under its synonyme *solidula*,

as having been found at *Postwick*, a locality which is by every one recognized as of true crag age.

The attention called to this matter has induced a most diligent search in the crag beds, by local collectors, for this shell, but such search has met with no success. I have always believed that it had been erroneously placed in Dr. Woodward's list, although Mr. Prestwich in the list of Mollusca which accompanies his paper on the crag (Q. J. G. S. vol. xxvii, p. 485) includes it, on this authority, among crag species, giving it however with a ? as from Postwick.

Dr. Woodward gives in most cases his authority for the occurrence of the different shells he names in his catalogue, but he does not do so in the instance we are discussing. One of the authorities, however, that he follows is the list given by Mr. Lyell (Sir Chas. Lyell), in the year 1839, and published in the 'Magazine of Natural History' (series ii, vol. iii, p. 313). Happening accidentally to refer to this paper, I found that the locality given in it for *Tellina balthica* is *Crostwick*. Dr. Woodward says nothing about *Crostwick*, which he should do seeing he quotes from the list in which this locality is given, but he gives instead *Postwick*. It seemed therefore to me likely, that one of these very similar names had been accidentally substituted for the other, and I mentioned the matter to Mr. H. B. Woodward of H. M. Geological Survey, the son of Dr. Woodward. That gentleman kindly undertook a search among his father's papers, and very fortunately found the original manuscript of the list, in Dr. Woodward's handwriting, and in it the locality for *Tellina balthica* stands *Crostwick* only! I may now congratulate the geologists of East Anglia, I think, that this matter, about which so much valuable time has been wasted, can at length be so satisfactorily cleared up. I am the more glad that it can be, as on my last visit to the British Museum, I found among the Norwich crag shells, a tray full of specimens of *Tellina balthica*, which had evidently been obtained from some glacial bed, but which were labelled "Norwich Crag, Postwick."

Another similar error likely to find its way into print, and so cause the insertion of this species in crag lists, has arisen from the fact, that Mr. A. Bell found, among a set of shells sent him by Mr. Crowfoot, of Beccles, from the Chillesford beds at Aldeby,

which are of upper crag age, a single valve of *Tellina balthica*. That this shell had accidentally found its way into this set of specimens is almost certain, for Messrs. Dowson and Crowfoot who have specially given their attention to the Aldeby deposits, have been on the look out for years for *Tellina balthica*, and have never found any trace of it, and they are both of them far too careful observers, as well as too good conchologists, to have allowed such a find as this would have been, to have escaped their notice. I may perhaps, give an instance of the way in which such mistakes arise, which occurred a year or two since. Mr. Wood had sent to a gentleman at Blackpool, in Lancashire, a specimen of the characteristic crag shell *Turritella imbricata* to show the difference between the middle glacial sands of East Anglia, in which this shell plentifully occurs, and the middle sands of the West coast at Blackpool and elsewhere, in which it is absent, but in which the common English recent shell *Turritella communis* (*terebra*) is the prevailing form. A few months afterwards, Mr. Wood's own specimen was returned to him mixed with a quantity of Blackpool shells, which were forwarded to him for identification.

Dr. J. Gwyn Jeffreys states that *Tellina balthica* is found in arctic seas, from Kamschatka and Behring Straits to the White Sea and Novaya Zemlia. It inhabits the Baltic, whence its name, and is also found extending in its range from the north of France to the Mediterranean. Were it not that it is said to occur fossil in the pliocene beds of Sicily, we might suppose that it originated in arctic seas, and first visited our shores when the glacial cold commenced. However, as far as our own beds are concerned, it clearly marks, by its occurrence, or non-occurrence, the dividing line between the horizons of the crag, and glacial series. It first makes its appearance in the basement beds of the lower glacial deposits of the Cromer coast, being found also in the middle glacial sands, and the upper glacial beds of Dimlington and Bridlington. It occurs also in the boulder clay of the north-west of England, in the Moel Tryphaen and other mountain fossiliferous gravels, and in the Irish drifts. It is met with in all the post-glacial deposits of Great Britain, being in East Anglia found in the March gravel, and the Nar valley brickearth, and it is invariably one of the most abundant forms met with. In the lower glacial beds it is often the case, that more than half the total number of

valves of lamellibranchiate mollusca are of this species, while at March it is by far the most abundant shell. It is to-day on all our coasts one of our most abundant species.

The great interest it has for geologists is, in my opinion, that it enables us, as does no other species, to separate most clearly the glacial deposits from those of crag age; and among other points which have been the subject of discussion with Norfolk geologists, it plainly shows, as I take it, that those deposits of stratified clay, sand, and gravel, which underlie on the Norfolk coast the Cromer till, which Mr. Gunn has termed the Laminated beds, are totally distinct from the Chillesford clay, which Mr. Wood and I maintain to be the uppermost member of the crag series.

It is worthy of note, that while the other common *Tellins* of the upper crag, viz., *Tellina obliqua*, *T. lata*, and *T. prætenuis*, are enumerated as occurring in those deposits in Iceland which correspond with our English upper crag, no mention is made of the occurrence in those beds of *Tellina balthica*, nor is this species found in any portion of the crag of Belgium.

II.

A LIST OF PLANTS OBSERVED NEAR CROMER IN THE MONTHS OF JULY, AUGUST, AND SEPTEMBER IN 1875 AND 1876.

Communicated by

CHARLES C. BABINGTON, M.A., F.R.S., &c., &c.,
PROFESSOR OF BOTANY IN THE UNIVERSITY OF CAMBRIDGE.

Read 31st July, 1877.

IT has been intimated to me, that a copy of my List of Plants noticed near Cromer would be acceptable to the Norfolk and Norwich Naturalists' Society, I therefore send the following catalogue, in which the names are those used in the 7th edition of my 'Manual of British Botany.' The bounds of my district are

Sidestrand, Northrepps, Felbrigg Park, the Black Beacon, and Beeston, but it is probable that I have omitted some plants which I ought to have found when they grew near to the border thus pointed out. It is my belief that very few plants which could be detected in the above months have escaped my notice. The list may probably be of use to any future author of a fully worked out Flora of Norfolk, and I hope that the time is not very far distant when such a work will be undertaken, not only for Norfolk, but also for Suffolk. Mr. Trimmer does not claim to have carefully examined more than a small part of the county, and Mr. Skepper's Flora of Suffolk is avowedly very incomplete.

I am sorry to see that in dividing Norfolk into districts, Mr. Geldart has taken no notice of Mr. Watson's division into East and West Norfolk, by the line of 1° of East Longitude; at least so I understand the statement in his paper read to the Society on February 23rd, 1875. As purely arbitrary divisions have to be used it would be well to keep that one which has been adopted by Mr. Watson in his very valuable works; an east and west line could be drawn in addition, which would not in any way interfere with Mr. Watson's districts, but only divide each of them into two. Mr. Watson's "Counties" and "Vice-counties" are now used by all our topographical botanists, and must be considered as definitely settled.

I now proceed to my list in which I have included a few plants gathered by Dr. Trimen alone, and not noticed by me. His paper will be found in the 'Journal of Botany,' vol. vi, of the New Series, page 133.

Ranunculus heterophyllus
R. lenormandi, West Runton
R. flammula, Beeston
R. acris
R. repens
Caltha palustris, Beeston
Papaver rhœas
P. Lecoqii
P. Argemone
P. hybridum, East Runton
Chelidonium majus
Fumaria officinalis
Cheiranthus cheiri, Cromer. Probably planted
Nasturtium officinale, Beeston
Barbarea vulgaris
Arabis perfoliata, Northrepps
Cardamine pratensis
Sisymbrium officinale
S. Sophia

S. thalianum
Alliaria officinalis
Sinapis nigra
S. arvensis
S. alba
Lepidium campestre
L. Smithii
Capsella bursa-pastoris
Senebiera coronopus
Cakile maritima
Raphanus raphanistrum
R. maritimus. Stated to have been found at Cromer. I did not see it there
Reseda lutea
R. luteola
Viola odorata
V. sylvatica, probably V. Riviniana
V. tricolor
Polygala vulgaris
P. vulgaris β. depressa, East Runton, Dr. Trimen
Saponaria officinalis, Cromer. A doubtful native
Silene anglica
S. inflata
S. conica, west of Cromer
S. noctiflora, Overstrand
Lychnis flos-cuculi
L. vespertina
L. diurna
L. Githago
Sagina procumbens
S. apetala
S. ciliata
S. nodosa, Beeston
Honkeneja peploides
Arenaria trinervis
A. serpyllifolia
A. leptoclados
Stellaria media
S. uliginosa, E. Runton, Dr. Trimen
S. graminea
Cerastium triviale
C. semidecandrum
C. arvense
Lepigonum rubrum
L. marinum. Said to have been found at Overstrand. I could not find it
Spergula arvensis
Scleranthus annuus
Malva sylvestris
M. rotundifolia
Hypericum tetrapterum, Beeston
H. perfoliatum
H. humifusum
H. hirsutum
H. pulchrum
Acer campestre
Geranium molle
G. pusillum
G. columbinum
G. Robertianum
Erodium cicutarium
Oxalis acetosella
Linum catharticum
Euonymus europæus
Ulex europæus } About equally abundant. Has *U. nanus* been really found in this county?
U. Gallii }
Sarothamnus scoparius
Ononis arvensis
Medicago sativa, a doubtful native.
M. sylvestris. Is, I think, truly native. Is it the M. falcata of Trimmer's Flora?

M. lupulina
Melilotus alba, Cromer. Probably introduced with crops. M. arvensis escaped my notice
Trifolium pratense
T. arvense
T. scabrum
T. repens
T. procumbens
T. filiforme
Lotus corniculatus
L. major
Anthyllis vulneraria
Vicia hirta
V. cracca
Lathyrus pratensis
Prunus spinosa
P. cerasus
Agrimonia eupatoria
Alchemilla arvensis
Potentilla argentea
P. tormentilla
P. reptans
P. anserina
Fragaria vesca
Rubus Idæus
R. affinis
R. Lindleianus, Roughton heath
R. discolor
R. leucostachys
R. calvatus
R. umbrosus
R. macrophyllus
R. hystrix, "Skates Hill wood," Rev. Dr. Hort. I have seen the specimen, but did not gather the plant
R. Koehleri
R. Balfourianus
R. corylifolius α. sublustris
R. althæifolius
R. caesius γ. ulmifolius
Geum urbanum
Rosa rubiginosa
R. canina
R. arvensis. I was too late for the roses
Crataegus oxyacantha (monogyna)
Pyrus malus (acerba)
Lythrum salicaria
Epilobium hirsutum
E. parviflorum
E. montanum
E. obscurum
Circæa lutetiana
Bryonia dioica
Sedum telephium
S. acre
Saxifraga tridactylites
Sempervivum tectorum. A doubtful native
Parnassia palustris, Beeston
Sanicula europæa, Dr. Trimen
Hydrocotyle vulgaris, Beeston
Apium graveolens, Beeston
A. nodiflorum
Ægopodium podagraria
Carum flexuosum
Pimpinella saxifraga
Sium angustifolium, Beeston
Œnanthe fistulosa, East Runton, Dr. Trimen
Æthusa cynapium
Fœniculum officinale
Pastinaca sativa
Heracleum sphondylium

Daucus carota
Torilis anthriscus
T. nodosa
Scandix pecten-veneris
Chærophyllum sylvestre
C. anthriscus
C. temulum
Conium maculatum
Smyrnium olusatrum
Hedera helix
Cornus sanguinea
Sambucus nigra
Lonicera periclymenum
Galium cruciatum
G. verum
G. saxatile
G. palustre, Beeston
Sherardia arvensis
Valerianella olitoria, Sidestrand
V. dentata
Knautia arvensis
Scabiosa succisa
Eupatorium cannabinum
Tussilago farfara
Nardosmia fragans. Not a native, nor truly naturalized
Erigeron acris
Bellis perennis
Pulicaria dysenterica
Filago germanica
F. minima
Gnaphalium uliginosum
Achillea millefolium
Matricaria parthenium
M. inodora
Chrysanthemum segetum
Artemisia vulgaris
Tanacetum vulgare
Senecio vulgaris
S. sylvaticus
S. erucifolius
S. jacobœa
S. aquaticus
Bidens tripartita, West Runton
Carlina vulgaris
Arctium majus
A. minus
A. intermedium
Centaurea nigra
C. scabiosa
Onopordum acanthium
Carduus nutans
C. tenuiflorus
C. lanceolatus
C. arvensis
C. palustris
Silybum marianum
Lapsana communis
Cichorium intybus
Hypochœris glabra
H. radicata
Leontodon hispidus
L. autumnalis
Tragopogon minor
Lactuca virosa
L. muralis
Taraxacum officinale
Sonchus oleraceus
S. asper
S. arvensis
Crepis virens
Hieracium pilosella
H. vulgatum
H. umbellatum
H. boreale, Dr. Trimen
Jasione montana

Campanula rotundifolia
Specularia hybrida
Erica tetralix
E. cinerea
Calluna vulgaris
Fraxinus excelsior
Ligustrum vulgare
Erythræa centaurium
Gentiana amarella
Menyanthes trifoliata, Beeston
Convolvulus arvensis
C. sepium
Cuscuta epithymum
C. trifolii. Introduced with clover
Cynoglossum officinale
Borago officinalis, Overstrand
Lycopsis arvensis
Echium vulgare
Lithospermum arvense
Myosotis palustris, Beeston
M. cæspitosa
M. arvensis
M. collina
Solanum dulcamara
S. nigrum
Hyoscyamus niger
Lycium barbarum. Quite naturalized
Orobanche minor
O. cærulea. Dr. Trimen found this on the east cliff. I unaccountably overlooked it
Verbascum thapsus
Linaria cymbalaria
L. elatine
L. minor
L. vulgaris
Scrophularia aquatica
S. nodosa
Pedicularis palustris
P. sylvatica, East Runton, Dr. Trimen
Euphrasia officinalis
Odontites rubra
Veronica beccabunga
V. chamædrys
V. officinalis
V. arvensis
V. polita
V. Buxbaumii
V. hederifolia
Mentha hirsuta
M. sativa
M. arvensis
Salvia verbenaca
Origanum vulgare
Thymus serpyllum
Calamintha officinalis
C. acinos
C. clinopodium
Prunella vulgaris
Nepeta cataria, West Runton
N. glechoma
Lamium purpureum
[Is L. album to be found at Cromer? I did not record it, and believe did not see it. Dr. Trimen does not name it as one of the common plants not growing there. It seems possible that it may be absent from the district.]
L. amplexicaule
Galeopsis tetrahit
Verbena officinalis

Pinguicula vulgaris, Beeston
Primula vulgaris
Anagallis arvensis
A. tenella, Beeston
Samolus valerandi, Beeston
Plantago major
P. lanceolata
P. coronopus
P. maritima. Observed by Dr. Trimen
Salsola kali
Beta maritima
Chenopodium murale
C. album
C. bonus Henricus
Atriplex littoralis
A. angustifolia
A. erecta
A. deltoidea
A. Babingtonii
Rumex conglomeratus
R. sanguineus. β. viridis
R. pulcher
R. obtusifolius
R. pratensis
R. crispus
R. acetosa
R. acetosella
Polygonum amphibium
P. persicaria
P. hydropiper
P. aviculare
P. convolvulus
Euphorbia helioscopia
E. peplus
E. exigua
Mercurialis perennis
Callitriche verna
Parietaria diffusa
Urtica dioica
U. urens
Humulus lupulus
Ulmus campestris
Salix oleifolia
S. caprea
Betula verrucosa
B. glutinosa
Alnus glutinosa
Fagus sylvatica
Castanea vulgaris. Planted
Quercus pedunculata
Q. sessiliflora
Corylus avellana
Tamus communis
Orchis pyramidalis
Habenaria viridis, Beeston
Spiranthes autumnalis, Beeston
Listera ovata
Epipactis palustris, Beeston
Tulipa sylvestris. Still abundant in Cromer Hall wood. I am told that it flowers
Endymion nutans
Juncus effusus
J. glaucus
J. obtusifolius, Beeston
J. acutifolius
J. lamprocarpus
J. squarrosus. In the Vallies
J. supinus
J. bufonius
Luzula campestris
Alisma plantago, Beeston
Triglochin palustre ,,
Sparganium simplex. In a pit by the road to Sidestrand

S. ramosum. In a pit by the Northrepps road
Arum maculatum
Lemna minor
Potamogeton natans
P. polygonifolius
P. crispus, East Runton, Dr. Trimen
Schœnus nigricans, Beeston
Eriophorum polystachion, Beeston
Carex arenaria
C. muricata, Incleborough hill
C. stellulata „
C. ovalis
C. glauca, Beeston
C. præcox, Incleborough hill
Scirpus setaceus, East Runton, Dr. Trimen
Anthoxanthum odoratum
Phleum pratense and β. nodosum
P. arenarium
Agrostis alba
A. vulgaris
Psamma arenaria
Phragmites communis
Aira cæspitosa
A. caryophyllea
A. præcox
Avena fatua
A. elatior
Trisetum flavescens
Triodia decumbens
Holcus lanatus
Poa annua
P. pratensis
Glyceria fluitans
Sclerochloa rigida
S. loliacea
Briza media
Cynosurus cristatus
Dactylis glomerata
Festuca myurus
F. ovina
F. rubra
Bromus asper
B. sterilis
Serrafalcus mollis
Brachypodium sylvaticum
Triticum repens
T. pungens
T. acutum
T. junceum
Hordeum marinum
Equisetum arvense
E. limosum
Polypodium vulgare
Lastrea filix-mas
L. dilatata
Polystichum aculeatum
Asplenium adiantum-nigrum
Scolopendrium vulgare
Pteris aquilina
Chara fœtida, Beeston

III.

LETTERS RELATING TO THE NATURAL HISTORY OF NORFOLK.

Communicated by Mrs. Richard Lubbock and Alfred Newton, M.A., F.R.S.

Read 18th December, 1877.*

[The following letters, the originals of which are in the possession of Mrs. Lubbock, Professor Newton, and Mr. Stevenson, contain, it is believed, much that cannot fail to interest the members of this Society, not only in throwing light on the condition of the fauna of the county at the time when they were written, but as affording additional insight into the pursuits and doings of some of the many earnest naturalists of Norfolk and Suffolk who flourished in the first half of this century. It is hoped, also, that their publication may not only show the importance of preserving such letters, but prove the means of bringing to light similar literary remains, stored up and possibly forgotten, in the houses of many of our county and city families.

The letters addressed to Mr. Selby and to Mr. Yarrell have been supplied by Professor Newton, to whose custody they were confided by the daughter of the former, and the executor of the latter, of these two distinguished naturalists. It will here be only necessary to remark that Selby, the author of many well-known works, was a Northumbrian gentleman, who died 28th March, 1867, in the 87th year of his age; and that Yarrell, whose reputation needs no further notice, died at Yarmouth, 1st September, 1856, aged 72.

The letters addressed to Mr. Lubbock by his intimate friend Charles Girdlestone, of Yarmouth, and by Yarrell, have been

* The introduction and footnotes have been added subsequently, by Professor Newton and Mr. Stevenson.

contributed by Mrs. Lubbock, who, finding them amongst her husband's MSS. and correspondence, placed them, at once, in Mr. Stevenson's hands, and, at his suggestion, readily consented to their publication.

A few words, however, are needed as to the writers of the letters.

CHARLES STUART GIRDLESTONE was the only son of Dr. Girdlestone, of Yarmouth, and, taking holy orders, became intimately acquainted with his neighbour, Mr. Lubbock, to be presently mentioned. Few letters, however, appear to have passed between them, and those here printed seem to be all of Girdlestone's writing that have been preserved. In Lubbock's company, Girdlestone spent several seasons in Scotland, and with the same companion, when in failing health, travelled on the continent in 1830—31. He never married, and his death from heart-disease took place soon after their return from this tour, in the autumn of 1831. His collection of books, birds, and other objects of interest were inherited by his sister, the wife of Mr. John Baker, a solicitor, first at Yarmouth and afterwards in London. One of these birds, a Jack Snipe, killed 2nd July, 1825 (*cf.* Stevenson's *Birds of Norfolk*, ii. p. 340), was given by Mrs. Baker to Lubbock, who in his turn presented it to the late Mr. Newcome; and it remains in the possession of his son, Francis Newcome, Esq., of Hockwold.

ROBERT HAMOND was born at King's Lynn, and was the third son of Anthony Hamond, of Westacre, and great uncle to the present owner of that estate. He was rector of Harpley, Gaytonthorpe, and Walton, and occupied much of his time in ornithological pursuits, his accurate knowledge, as a sportsman and naturalist combined, enabling him—an amateur bird stuffer—to give in form and attitude a most life-like character to his specimens, enhanced by the appropriate accessories with which his cases were fitted up. As a taxidermist he was a pupil of the late Rev. Henry Dugmore, of Beachamwell, whose style of "mounting" he even excelled in the points above referred to; and both in the collecting and stuffing of his own birds he received frequent and able assistance from his friend, Mr. Scales, of Beachamwell.

At Mr. Hamond's death, which took place on the 14th of June, 1831, his ornithological collection passed into the possession of his sister, the late Miss Sarah Hamond, of Swaffham, at whose decease, it became the property, by her bequest, of the late Mr. Robert Elwes, of Congham (*cf.* Stevenson's *Birds of Norfolk*, vol. ii. p. 33).

JOHN DAVEY HOY, of Stoke-by-Nayland, in Suffolk, was born 16th January, 1796, and died 15th October, 1839. His many contributions to the *Magazine of Natural History*, and communications to Mr. Hewitson's oological work, shew him to have been a very keen and accurate observer. He must indeed be regarded as one of the earliest of those intelligent amateur collectors who have so remarkably advanced the study of ornithology. He was greatly attached to the sport of falconry, and in its pursuit, as well as to enrich by personal captures his collection of eggs, he several times visited the continent, where he underwent so much hardship that he was considered thereby to have injured his health, and not a little to have contributed to his early death.*

The following extracts from a memorandum book in his handwriting (kindly lent for the purpose of illustrating these letters, by his sister, Mrs. Lescher, of Boyle's Court, near Brentwood, in Essex), may be here appropriately introduced :—

[1833 ?] "Wednesday 15th May. Left home half-past five, with Goshawk on hand ; reached Didlington High Ash about two o'clock. They had lost their best Hawk, called 'Bulldog,' the day before. We saw him after the Rooks as we were walking from Mundford. Did not go out : gave some of the Hawks a train-Heron close by.

"Thursday 16th. . . . . In afternoon had two flights—one a good one—and caught the Heron well in sight after many stoops and turns. The other escaped. One Hawk left and pursued a Missel-Thrush, and the other gave it up after flying about a mile towards the heronry. Day very hot.

"Friday 17th. Day very hot and clear. Had one flight but not a good one. A very good hood-off. Hawks did not behave well. Drove over to Mr. Newcome's in morning, took lunch with him, looked over his garden and grounds. Saw the Jer Falcon which he had set up for Lord Berners, and a rare species of Duck : think it to be the Ferruginous Duck, an old male. Saw a painting of the Icelander, and a portrait of a nobleman with a Hawk

* A short notice of his death by Mr. Charlesworth will be found in the *Magazine of Natural History* (ser. 2, vol. iii, p. 604), and an extended account of his collection, as then existing at Mrs. Lescher's house, by Dr. Bree, is contained in *The Field* for 1867, p. 251, *et seq.*

on his hand. Gave him a pair of eggs of the Tree-Sparrow, a Ring-Ouzel's egg, and Great Butcher-bird's egg. Received from him a Short-eared Owl's egg, and a Water-Rail's egg. Gave Mr. Salmon a pair of eggs of the Bearded Titmouse, a Great Butcher-bird's egg, and a Woodchat's. Mr. Salmon came over on Thursday afternoon and gave me an interesting account of his excursion to Orkney. He promised me an egg of the Red-necked Phalarope if I did not succeed in getting any.

"Saturday [18th]. Very warm, but not quite so hot as it had been. Went to Cranwich Field, had excellent sport. Two Herons came together: they hooded-off 'the old Miller' and another good Hawk. They each took a Heron. 'The Miller,' after a good flight, took the Heron. The other Heron mounted by small rings with great rapidity, the Falcon keeping close to him till he got above, and made several stoops, but the Heron kept mounting and got so high that it was scarcely visible, and at times quite lost to sight. The Heron in the end beat him, and the Falcon came down from his dizzy height like an arrow, at two Stock-Doves passing under him, and was taken in by the falconers. Had another flight afterwards, [the Hawk] with a good deal of work caught the Heron, but let it go on the ground, and afterwards shewed an excellent flight with many stoops, but would not catch again. They lured the Hawks after flying a long time. Left Mundford at half-past nine, remained until Monday after breakfast at Mr. Gardiner's [at Thetford], home at five in the afternoon."

* * * * * *

[1833?] "Left home Sunday evening, June 23rd, about six o'clock, reached Bury a quarter before ten, slept at the Six Bells. Started Monday morning at half-past six, reached Mr. Gardiner's at a quarter before eight . . . . . Started about twelve, reached Mundford at one o'clock, and the High Ash a quarter before two. Went down to the Hall with the falconers, and from thence to Cranwich Field. A heavy shower of rain came on; afterwards a fine evening. Many Herons went over: hooded a Rook-Hawk off at a Heron, rather low, as we could not find a Rook, but he would not mount: came prettily at the Pigeon, when he was taken in. Missed two or three chances at Herons during this time. Two Herons shortly after came over together. A fine hood-off, but unluckily the Hawks divided, and each took a Heron. One made up to the Heron and made two good stoops, but neither of the Hawks would fly well singly. He then left his Heron, and was taken in. The other mounted well and made two or three rings and left also, and came down with great velocity at the Pigeon, stooping at it several times. Two Herons again soon made their appearance, and we had a splendid hood-off. 'The Old Miller' and the Haggard Jer. The Heron was high, but they mounted very quickly. The Heron soon found that mischief was intended and mounted screaming. He was a light Heron. The Hawks flew in wide circles and soon outsoared their quarry. Several fine stoops were then made, and one Hawk, making a rapid and lofty stoop, seized the Heron. The other bound to him almost immediately, and they fell within a short distance of me. The Heron was so disabled (his back appeared broken) that we killed him. Several other Herons came over, but

wide and high, but were kept in expectation by the falconers riding to get the windward of them. Lord Berners out, and a tolerable field—both the Newcomes."

Of Mr. John W. Elton no further information can here be given than, that he corresponded with Selby for more than ten years.

Dawson Turner, F.R.S., F.S.A., was born at Yarmouth, in 1775, and became a partner in the branch of Messrs. Gurneys' bank in that town. An accomplished scholar, archæologist, and topographer, he was also a distinguished botanist, and, as the letters now published shew, was always ready to aid the investigations of workers in other branches of science. He was one of the earliest Presidents of the Norfolk and Norwich Museum in which he was much interested. Mr. Turner, by his wife, Mary Palgrave, had two sons and six daughters, and through the artistic talents of the latter was largely assisted in the illustration of his various publications. Of these, two only survive, the wife of Dr. Jacobson, the present Bishop of Chester, and the widow of the late Mr. Brightwen, of Yarmouth. Of the rest, one was married to Sir W. J. Hooker, father of Sir J. D. Hooker, P.R.S.; another to Sir F. Palgrave; a third to John Gunn, Esq., F.G.S., whose magnificent collection of fossil mammalian remains, from the Norfolk coast, was recently presented by him to the Norwich Museum; and one died unmarried. Two of his grandsons are Mr. Gifford Palgrave, the celebrated traveller and Mr. Francis Palgrave, the well-known writer on literature and art. Mr. Dawson Turner died at Yarmouth in 1857. His illustrated copy of Blomfield's *History of Norfolk*, forming seventy volumes and cases, was purchased at his death by the British Museum, and may be considered to be the finest county history in existence.

Richard Lubbock, the well-known author of the *Fauna of Norfolk*, was born in Norwich, in 1798, the eldest (and last survivor) of the eight children of Richard Lubbock, M.D., an eminent physician of that city. Intended for the church, he graduated at Pembroke Hall, Cambridge, and was ordained in 1825. His early taste for natural history, and ornithology in particular, was fostered by his clerical duties for some years associating him with the "Broad district" of the county, and his ample opportunities for sport with rod and gun, gave him that

thorough insight into the habits of the fishes, birds, and the smaller mammalia of Norfolk, which caused his work, published in 1845, to take at once a foremost place amongst local faunas, and to assume, for all time, the position of a standard authority. His various tours in Scotland, Wales, and Normandy, in company with his friend, Charles Girdlestone, have been already referred to, as also his more important tour on the continent, in 1830—31. In 1837 he was presented to the living of Eccles, near Attleborough, by his brother-in-law, Sir T. B. Beevor, Bart., where he resided till his death, which took place on the 25th of November, 1876. Mr. Lubbock was for some years an active member of the Committee of the Norfolk and Norwich Museum, whose objects he promoted by a course of lectures on natural history and other topics. He was chosen an Honorary Member of this Society soon after its formation, and a more extended memoir will be found in its *Transactions* (vol. ii. part iii. pp. 292—306).]

I.

YARMOUTH
NORFOLK
JAN^Y. 4TH 1822.

MY DEAR LUBBOCK,

First to give you all the information I can procure with respect to Jack Snipes. The person I have consulted, is old Standford, who has been a Snipe shooter ever since his childhood, and was bred, and born, in a Snipe country: and he tells me he never saw a Jack Snipe in the Summer. Mr. G. Lucas* told me a little time since, that he saw a collection of eggs, belonging to a gentleman, which was nearly complete with all the species indigenous to this country, and they shewed him some *eggs* which they assured him were Jack Snipe's, and taken in this country, which he seemed, and *told* me that he was, *very dubious as to the truth of.* We always have a large flight of *Whole Snipes* about

* The gentleman here mentioned was no doubt the late Rev. George Lucas who, at that time, resided at Little Ormesby, near Yarmouth. He was both a naturalist, and sportsman, and Rector of Catfield and Billockby.

the latter end of July or beginning of August; and on the 28th of the former month I killed 15 Snipes, and at that time used to kill constantly 5, & 6 couple—these I presume are the offsprings of the birds which remain here during the breeding season, and old Standford with Palgrave killed 33 couple just before harvest.

The Snipes leave us about the beginning of December, but this entirely depends upon the state their feeding grounds are in, and they are much more influenced by the frost than rain—one night's severe frost will *sometimes* drive them all away; whereas they will resort to Turnip fields in wet weather, and I believe get as good a living from worms there, as in the fens: when we shoot Snipes in frost the birds are thin, in wet weather they are fat—for instance, in the present extreme wet season. I have not said any thing about your migration hypothesis, for I perfectly agree with you—tis a pity you have not some friend in Devonshire, Ireland, South of France, Spain and Portugal, I shall now transcribe a passage from Montagu on the Migration of the Woodcock, who has exactly the same idea on these birds as you have with respect to the Snipes.

"It is generally admitted that woodcocks are more plentiful in Devonshire, and Cornwall, than in any other part of England, but they are not near so numerous as in Ireland, and they seem to increase in number, in the western parts of that Kingdom. From this circumstance it should appear, that the great column of woodcocks in their passage to and from the North, fly in that latitudinal direction, which is intersected by the western parts of Ireland. Those which continue their route further south, would find their next resting place in Portugal; and as that part of the continent of Europe, is in the same latitudinal direction with Ireland, we should expect to find them equally plentiful in that country. In this we have not been disappointed; for we have lately been assured by our friend Capt. Latham, who is with the combined army in Portugal, that woodcocks are very plentiful in November. This gentleman in a letter to the author says "We have been so much in motion, that I have not had much time for shooting, but I have some days killed 14 or 16 couple of woodcocks to a pointer, in low shrubs." It seems they become scarcer as the Winter advances even in that country, so that we may reasonably infer, that a large portion continue the same latitudinal direction Southward, until they arrive in Africa. In the beginning of March on their return

Northward, woodcocks are again observed in Portugal in great abundance, but disappear as the warmer season approaches." *—

I shall be glad to hear from you as soon as you receive this, and shall be glad to hear any thing on the subject of birds . . . When you come to this part of the world, do not forget there is such a place as Yarmouth, I shall be glad to see you.

Believe me dear Lubbock
Yours very sincerely
CHS. STUART GIRDLESTONE

II.

YARMOUTH
NORFOLK
THURSDAY NOV^R 4TH 1824

MY DEAR SIR

On Tuesday last, I sent you a small box containing the eggs I promised you, viz. two specimens of the egg of the Norfolk Plover, one of the Spotted Water-Rail, and also a specimen of the egg of the Bearded Titmouse, which last I had some difficulty in procuring, my bird-stuffer not being very willing to part with it: the Bearded Titmice plentifully breed with us, but their nests are extremely difficult to discover, as they build in large beds of reeds. Bitterns also breed with us, but their eggs for the same reason are seldom found. I sent you a fresh specimen of the Grey Phalarope. I think I recollect seeing one in your museum, but possibly you might have purchased yours, in a preserved state: the one I sent was remarkably small, probably a female, or a young bird: this however you will discover upon dissection. I sent you a stuffed specimen of the Spotted Snipe (Scolopax totanus) of Montagu: he describes it as a rare species and I believe it is, *certainly with us*—see his supplement and the plate. The specimen I sent you was killed this last September. I sent you according to promise a specimen of the Pigmy Curlew, likewise a specimen of

* This passage is from the 'Supplement' to Montagu's *Ornithological Dictionary*, and was published in 1813. Capt. Latham, it is added in a footnote, had since fallen in the breach at the siege of Badajos.

the Red Sandpiper, Tringa Icelandica, or what I have always considered to be the Red Sandpiper, if I am wrong as to this bird have the goodness to tell me, and also what Tringa it is. I have now scraped together some of the provincial names of the water fowl of this part of the world. Golden eyes are frequently and almost always called Rattle wings here. Wigeon *always* Smee; Shieldrakes, I think in parts of Norfolk, Shellfowl, but here always Barganders; Pochards *Dunbirds* or *Pokers*; Tufted Ducks are always called Goldeneyes here, though in some parts of Norfolk they are called *Arps;* Teal in parts of Norfolk too are called Cricks, and Garganey Summer Cricks. Pintail ducks are called Sea pheasants, Shovelers always *Becks.* The common Water Rails are called Rails, but the Spotted Water-Rails are called Quails. The Goosander here is often called Merganser; but all the birds of the genus Mergus, generally come under the sweeping clause of Sawyers—from their serrated bills. The Avoset is called a Shoe-awl, I suppose from the bill resembling a Shoe-maker's awl. The following ducks I know breed with us, Duck and Mallard, Teal, Garganey, Shieldrakes, and Shovellers. By the bye the Avoset breeds at a place called Horsey, nine miles on the coast from hence, if you look on the map you will see Winterton: Horsey joins it. I mention this circumstance, as Horsey is a most extraordinary place for all sorts of wild birds (though nothing so good as it was ten years ago) and should you come into this part of Norfolk, I will show you this place, the whole of this parish belongs to a Mr. Robert Rising:* it is a most desolate

* This gentleman, who died in 1841, aged 73, was owner of most of the soil in the parish of Horsey, next the sea, and lord of the manor, which he purchased of Sir G. B. Brograve, Bart., and others, about the close of the last century. By drainage, planting, raising the sea banks, and the formation of roadways, he did much in his lifetime to alter the condition of things referred to by Mr. Girdlestone, and a still further outlay of capital in a like enterprising spirit, by his son, Mr. Robert Rising, who resides at the Hall, has rendered many parts of the estate exceedingly fertile, though the mere (about 130 acres of water), and the surrounding reed beds and marshes, still retain much of their original character. The present proprietor, a keen sportsman in his earlier days, with a great taste for ornithology, possesses a fine collection of birds, chiefly procured at Horsey and in its immediate neighbourhood, including, amongst many rarities, the adult male Buffel-headed duck *(Clangula albeola)*, shot at Yarmouth, about the year 1830. This bird formerly in Mr. Steven Miller's collection at Yarmouth, is the only authentic Norfolk specimen, and was figured by Yarrell.

place, and duty at Church is performed only once in a month, and in winter this place is scarcely approachable. Woodcocks & Jack Snipes came over this season very early, a great many of the former were seen on the 15th of Octr, and I killed six Jack Snipes on the 24th of September, and a friend of mine shot some Jack Snipes, a few days before the 24th. I very much want to discover a Jack Snipe's nest, but am afraid I shall not succeed, though I once shot 2 Jack snipes close on to May, which much looked as if they intended having an amatory proceeding in this country: I have reproached myself often since, for killing these two birds, as possibly I might have been in possession of what no man I believe is, I mean the Jack Snipe's egg laid *in this* country. Your museum is already so rich, I am fearful any birds I could send you, would not be acceptable, but if there are any specimens that *I can send* you, I shall be very glad so to do. We are richer in the Scolopax and Tringa tribes, *perhaps* than any other county in England; if any of these would be of use to you, there are few, *very few*, I could not procure you in the space of 12 months. I am informed the Red Godwits breed in some marshes about ten miles from hence; but I cannot speak to the fact, but this I know, we had some shot near about the 20th of June—last season, and my bird-stuffer says he has had them in all the summer months and he is a man of veracity. Pray make my compts. to Mrs Selby, and remember me to your brother & Capt. Mitford,* Mr. Burrell† & Major Ogle,† also all my other northern friends. Believe me dear Sir

Yrs very truly
C. S. GIRDLESTONE.

P.S. Scaup ducks are called Greybacks

P. J. SELBY ESQR
TWIZLE HOUSE
BELFORD
NORTHUMBERLAND

* Captain, afterwards Admiral, Robert Mitford, of Mitford in Northumberland and Hunmanby in Yorkshire, was brother-in-law to Mr. Selby, and rendered him much assistance in his ornithological studies. He was born in 1781, and died in 1870. His only daughter and heiress married Mr. Tyssen-Amhurst, of Didlington in Norfolk.

† These gentlemen were neighbours of Mr. Selby's.

III.

[1829]*

My dear Lubbock,

It was with surprise, I learned from your letter, you had been so unwell; but hope you have overrated the time that you expect to be domiciled. As you will not be able to go to Horsey for the fishing, at present, and you want some pike, I will go over next Week, and take Hewitt with me, and I will send you some fish by Watts on the following Saturday. When you were at Yarmouth last, I recollect you asked me about the *Morillon Duck*, I now send you one, and it is by no means an uncommon fowl here, and is one of the few birds, which Montagu fell into error respecting, and perhaps from the circumstance that he never saw the bird. But you will say "if it is a common fowl here (Yarmouth) is it not probable they would visit the Devonshire coast with the other ducks, when they are driven from the Norfolk coast by the severity of the weather. My answer is, no—because as Col. Hawker says the Golden-eyes, and Morillons go out to feed every night to sea, where they will remain tossed about in the most tempestuous weather; and I learn from the gunners that these fowl, the Morillon, which they call the Little Rattlewing, will remain here and at sea, when every other species of fowl is gone to the southward.

Montagu seems to think that as far as he has been able to discover, that naturalists have considered the immatured Golden-eye as the Morillon, but just have the goodness to compare the

* The date of this letter is approximately fixed by a passage in one of Lubbock's MS. books, now in the possession of the Secretary of the Society (p. 247), as follows:—"I, some years since, whilst staying with my friend Mr. Girdlestone, talked with him on this point. The following winter, 1829, I received from him a letter, an abstract of which is as follows:—'When you were last in Yarmouth, we spoke upon the Morillon. I now send you one,'" &c., &c., very nearly as above. The letter here printed, bears no post-mark, and most likely accompanied the birds mentioned therein, while the other letter, from which Lubbock quotes, was probably sent by post; but from the identity of various expressions in them, they evidently must have been written almost simultaneously.

The subject of the whole letter, the supposed distinction of the Morillon and the Golden-Eye, has long since been settled in the negative. To discuss it here would answer no good purpose.

bill of the Morillon with the female Golden-eye (a specimen of which I send you) and you will not only perceive a vast difference in the color and conformation of the bill, but a still more striking feature, viz the placing of the nostril so remarkably forward, in the Morillon, and the nail (the extremity of the bill) is neither so long nor so obtuse—and as to the color of the bill to which I attach much less import, is you will perceive, as opposite as black is to white. The color of the legs too is very different. The female of the Golden-eye has its bill precisely like that of the male in all respects, as I had an opportunity of comparing this female with a beautifully fine specimen of *an old Golden-eye.* Montagu observes that the trachea of the male Golden-eye swells out into a huge labyrinth and I send you one which was taken from the bird I have just mentioned—how extraordinary it is that the female should not possess this same sort of trachea, for you will perceive that her trachea is a perfect cylinder. Bewick very accurately describes the Morillon and notices the nostrils being placed so forward. As you have not the first volume of Montagu I send it for you to look at. See him under Golden-eye, and Morillon. It is quite certain the Golden-eye is a long time in attaining that beautiful plumage, and it is very seldom an *old bird* at least *in his gay* plumage is killed. I have written this hastily as I am obliged, or shall not be in time for coach. . . . . Send my Montagu home soon if you please, and give me your opinion about the Morillon. The Golden-eyes here the gunners call the Rattle-wing, and the Morillon the Little Rattle-wing but they consider them distinct species. If you can, observe whether the Morillon is a male or female—because should it be a male: if it be a young Golden-eye it ought to be possessed of the labyrinth in the trachea, and I can feel that there is none, for you may feel it quite plain in the throat of an old bird. Therefore if this Morillon turns out to be a male, which I much suspect it will, it must be a distinct species.

Yrs very sincerely

C. S. GIRDLESTONE

See Bewick on the Morillon

REVD. R. LUBBOCK

IV.

SWAFFHAM
APRIL 28th 1824

DEAR SIR

It is such a length of time since you did me the honor of requesting me to write to you, which I have neglected, that I fear you might have imagined that I never had recovered from the painful operation which I had undergone when I was at Cheltenham: but I am happy in being able to say I am now in the fashionable term "all right": & yet hope to pay you a visit in the beginning of the Grouse Shooting on my way to Lord Huntly's* where I am going with a regoodal sporting friend in this neighbourhood, who, altho' no stuffer, is always anxious to procure Birds to enable me to make an increase to my collection. I recollect you were anxious to obtain a specimen of the Thick-kneed Bustard, Charadrius Oedicnemus, & am very happy in being able to send you a pair, I may say in the best plumage I can procure them, as they are just come over into this Country to breed; but from whence I know not. I only know that after the breeding season about the middle of September you may see hundreds in different parts on the light lands, particularly on the Warrens, in large flocks, & after that month not one is to be seen: I never could find any one, altho' [he may be] a scientific ornithologist, who can tell me where the Dotterel are moving to, when we see them in large flocks in this country in April & August, & never later. I am sorry I canot let a Bustard accompany the Stone-Curlews; but they are now becoming exceeding scarce. I saw three about a month ago, & one female yesterday, & generally on the same spot; & I have found from observation that a female will frequent a certain field, unless disturbed, for near a month before she deposits her eggs, which is generally about the 12th of May. There was a nest destroyed by the weeders last year near the spot I can generally see the one in question. I wish you would pay me a

* George Gordon, eldest son of Alexander, Duke of Gordon, born 1770, succeeded his father (in whose life-time he bore the courtesy-title of Marquess of Huntly), as fifth Duke, in 1827, and died in 1836.

visit & I think I could show you some.* I am certain in winter, if not in summer; & I am now confident in asserting that the males come & visit the females, as they are never seen together at this season of the year. I can assure you I am quite delighted in being able to send a male & female of the Thick-kneed Bustard or Stone Curlew, which I suppose they are, as I shot them together. A good specimen of the Little Bustard was shot in Norfolk this last winter, but I was not fortunate enough to obtain it: I used to have capital sport in hawking the Stone-Curlew, I think far superior to Heron-hawking which we carry on in good form. The Germans arrived last week with twenty† falcons & I expect to see capital sport. I have been endeavoring to obtain the Icelander, to hawk Bustards & Wild Geese, which I think would be magnificent diversion; but I fear, unless direct from the King of Denmark, they are not to be procured. I have been up to & fond of all sorts of sporting all my life, and altho' a minor‡ can show capital diversion with my Stag Hounds, having no foxes: game being such a treasure, that we are contented with humble Buck Hounds & *posting*§ Harriers. I shall be most anxious to hear the Birds, I now take the liberty of sending you, will reach you safe. Any other kinds that I can procure for you I beg you will command & believe me

Dear Sir
Yours most faithfully & obliged
ROBERT HAMOND.

P. J. SELBY ESQRE

* This visit was soon after paid, for in 1825 Selby published his plates (64 and 64*) from the specimens in Hamond's collection, which, at the death of his sister, Miss Hamond, of Swaffham, came into the possession of the late Mr. Robert Elwes, of Congham, and is still preserved at Congham House.

† This word is not clear in the MS. It might be "seventy."

‡ That is a younger brother in schoolboy-phrase.

§ Posting is now so much a thing of the past that readers may forget that in old days the slowness of post-horses was proverbial.

V.

STOKE BY NAYLAND SUFFOLK JUNE 23° 1828.

SIR,

Having been highly gratified in looking over your splendid Illustrations of British Ornithology & thinking that anything you had not perhaps observed in the habits of some of our Birds, might not be uninteresting to you, I have ventured to forward you a few observations I have made on some of the Birds inhabiting this part of the Country. In the Genus Sylvia, the Lesser Whitethroat, Sylvia sylviella, does not appear to have fallen under your immediate observation: * it is a common species in this neighbourhood arriving in the spring about the same time as Sylvia cinerea: it is an active, restless little Bird fond of thick bramble hedges, among the branches of which it insinuates itself with great ease & quickness; it builds a smaller & more compact nest than S. cinerea: its note of alarm is similar to Sylvia Hortensis, & it is very vociferous on your approach to its nest: it remains with us until the middle, & sometimes the end, of Sep^tr, frequenting gardens, being very fond of fruit: its plumage in autumn is beautiful, the breast being of a silvery whiteness. I have had several nests of that most beautiful & elegant of our indigenous Birds, the Bearded Titmouse. The margins of the extensive pieces of water called Broads in the south-eastern part of Norfolk which are skirted with large tracts of reeds are the favorite abode of this species: its nest is composed, on the outside, with the decayed leaves of the sedge & reed, intermixed with a few pieces of grass, & invariably lined with the top of the reeds in the same manner as the Reed Wren: it is not so compact a nest as the Reed Wren's:

* When Selby, in 1825, published "Part First" of the text to his *Illustrations of British Ornithology*, containing an account of the 'Land Birds,' he said (p. 179) that, not having been able to meet with a recent specimen of the Lesser Whitethroat, he contented himself with alluding only to the species. In his second edition, published in 1833, he included it, specially mentioning (p. 216) a nest, together with the eggs and parent birds, "received from Suffolk"—one, no doubt, of those sent him by Hoy, as will be seen by the next letter. Nearly all the remarks in the present letter have reference to statements made by Selby in his first edition, many of which were modified according to this information in the second edition.

the eggs vary in number from four to six, pure white sprinkled all over with small purplish spots, rather confluent at the larger end; full size of the Greater Titmouse. The nest is generally placed in a tuft of grass or rushes near the ground by the side of the water ditches in the fens, sometimes on the broken-down reeds, but never suspended between the reed-stems in the manner of the Reed Wren. In the autumn they disperse themselves in little parties along shore, where ever there is an acre or two of reeds; during the winter months they feed entirely on the seed of the reed, & so busily employed are they in searching for their food that I have taken them with a fine birdlime twig attached to the end of a fishing rod: when alarmed by any noise they drop down among the reeds but soon resume their station again, climbing up the reed stems with the greatest facility. I have frequently seen a reed bent down with the weight of a Bird nearly to the water's edge; sometimes hanging with its back downwards in the most beautiful attitudes: they are found a considerable way inland. I observed many of them on the borders of Whittlesea Mere the beginning of July 1826, with their young; the young Birds have black feathers, extending from the hind part of the neck down the middle of the back to the rump, which they lose the first moulting; their food in the summer consists of Insects & their larvæ & the seeds of the larger rush which grows in abundance in most waters. Your account of the nest of Sylvia Locustella differs rather from several that have come under my observation: it is composed externally of moss & a few dead leaves & lined with the decayed stems of the Ladies bed straw, galium, and some pieces of fine grass, it does not bear any resemblance to the common Whitethroat's being a large, close-built nest, greater in size & thickness than even the Sedge Warbler's: the eggs from six to seven in number of a fine rose color, very thickly sprinkled with minute spots of a rather deeper shade. I have four different times succeeded in finding its well-concealed nest: it frequents low underwood, & places its nest in a low stub or bush near the ground; the grass is pulled down & arched over it in a curious manner, & there is an opening on one side by which the Bird runs on & off its nest: the Male and Female sit alternately. I have seen them here as late as the first week in Sep$^{tr.}$ The Tree Sparrow visits us regularly in autumn in considerable numbers & remains until Feb$^{y.}$ or March. The Siskin I have observed in most seasons; this

spring they remained with us until April 21st feeding at that time on the Spruce & Larch Firs. The Rough-legged Falcon visits the Rabbit warrens in Norfolk [*ev*]ery season, som[*e*] ye[*ars in*] considerable numbers. The Short-eared Owl has als[*o bee*]n fou[*nd to stay & breed o*]n some of the heathy lands of the western part [*of Norfolk. A specimen of Pr*]ocellaria Leachii was picked up this last [*winter at Coggeshall, in Essex,*] apparently in an exhausted state. On the [*20th May, 1827, a pair of the Pra*]tincole, Glareola austriaca, were shot nea[*r Yarmouth. A specime*]n of the Gallinula minuta, of Montagu was [*shot near Yarmouth last*] May.

I have received several sp[*ecimens of Godwits, Scolopax ægocephala,*] & Limosa, at different times from Ya[*rmouth. A few of them breed ann*]ually in the fens near Yarmouth, i[*n the same locality as the Ruffs, wit*]h wh[*ic*]h they are sometimes taken. Th[*e Red-legged Partridge is numerous*] here, & on the heathy tract near the [*coast it far exceeds the common*] species in numbers. A Long-legged Plover [*was shot on the banks of Breydo*]n Broad, near Yarmouth, in M[*ay, 1823, in which neighbourhood also m*]ost of our rare Water Birds h[*ave been met with during the last*] 8 or 10 years. I should have [*much pleasure, if you wished it, in forward*]ing you specimens of the Lesser W[*hitethroat, with its nest and eggs. I am, Sir, y*]our obednt humble

[*servant, J*]OHN D. HOY.

[PRIDEAUX] JOHN SELBY ESQR.
[TWI]ZELL HOUSE
NORTHUMBERLAND.

[A copy of this letter, which is in an injured condition, was printed by Dr. Bree in the *Field* newspaper for November 9th, 1867, from a transcript in the handwriting of, and lent to him by, Mrs. Lescher. Some part of that portion which is now missing must then have been in existence, but the letter had probably already sustained some damage. Yet the remains prove that the published version is not altogether accurate, and in particular the passage about the Pratincoles, which was entirely misunderstood, and has naturally led to further comment (*cf.* Stevenson's *Birds of Norfolk*, ii, p. 64, note). It will be seen that there was nothing improbable in Hoy's statement. An attempt has been made here to restore the missing portion with the help of the older copy—the words supplied being enclosed by square brackets. But that readers may judge for themselves how far this conjectural restoration may be justified, Dr. Bree's version of the concluding part of the letter is here subjoined :—

"The Rough-legged Buzzard visits the rabbit warrens in Norfolk every season, sometimes in considerable numbers. The Short-eared Owl has also been found to stay and breed on some of the heathy lands of the western part of Norfolk. A specimen of Leach's Petrel was picked up this last winter near Coggeshall, in Essex, apparently in a state of exhaustion. On the 20th of May, 1827, a pair of the Pratincole (Pratincola glareola) were shot near Yarmouth. A few of them breed annually in the Fens near Yarmouth, in the same locality as the Ruffs, with which they are sometimes taken. The Red-legged Partridge is numerous here. On the heathy tract near the coast it far exceeds the common species in numbers. A Long-legged Plover was shot on the banks of Breydon Broad, near Yarmouth, in May, 1823, in which neighbourhood, also, most of our rare water birds have been met with during the last eight or ten years. I should have much pleasure, if you wished it, in forwarding you some specimens of the Lesser Whitethroat, with its eggs and nest.—I am, &c., JOHN D. HOY."]

VI.

STOKE NAYLAND SUFFOLK.
MARCH 19TH 1831.

SIR

You must, I fear, consider my conduct rather strange, after offering to send you specimens of Birds & eggs, to have let so much time elapse without taking further notice of it; but I was disappointed in not being able to procure the young Birds of Parus Biarmicus in nestling plumage during the last summer, & also the nest & eggs of Sylvia Locustella, my engagements having been such that I could not look after them myself. I have also been some time in Holland & the Netherlands & have not long returned.* I have sent the nest & eggs of Bearded Titmouse & Birds, with two nests of S. Sylviella & pair of Birds, the nests & eggs of Golden Oriole with a young male bird in first plumage & adult female. I

* As appears by the memorandum book in Mr. Hoy's handwriting, mentioned in the introduction to these letters, he left England November 3rd, 1830, and passed some weeks at Valkenswaard (where, it may be mentioned, he met Mr. Robert Hamond), returning home, January 14th, 1831.

hope during the ensuing summer to get the young of P. Biarmicus. You mentioned the female Fringilla Montana. I have never observed any difference in the plumage of the sexes excepting the bay color on the head of the female not being quite so bright as in the male: I have the eggs of this species. I have lately seen three specimens of the Purple Crested African Heron, Ardea purpurea, killed in this country—two of them in Norfolk & one near London, the latter an adult male & most splendid bird.* I have forwarded the box by an Edinburgh steamer from London, & directed it to the care of Mr. D. Lizars,† & to be sent on to you. A Crane was shot in Oxfordshire about three months since,‡ & two specimens of Accentor alpinus at Cambridge.§

I am Sir Your Obdt. Servt.

J. D. Hoy.

I have thought it better to send you this by post: the box will be sent by an Edinburgh steamer from London on Saturday the 26th March, directed to the care of Mr. D. Lizars for you.

P. J. Selby Esq.

* These are mentioned by Selby (*Illust. Br. Orn.*, ii. p. 16, note), but without the introduction of Hoy's name. What is known of the Norfolk specimens is given by Mr. Stevenson (*B. Norf.* ii. pp. 146, 147).

† Daniel Lizars of Edinburgh, elder brother of William H. Lizars, an engraver of considerable merit, and publisher of Selby's and several of Jardine's works. The first Lady Jardine was his sister. He emigrated to America, and died there about 1868.

‡ This is also noticed by Selby (*ut supra* p. 8, note). Messrs. Matthews in their 'Birds of Oxfordshire' (*Zoologist*, p. 2600) mention only one Crane as having been shot in that county, and this, say they, in the spring of 1829.

§ There is possibly a mistake here. The only two examples of the Alpine Accentor known to have been observed at Cambridge were those seen in 1822, one of which was shot, as soon after recorded (*Zool. Journ.* i. p. 134), and as mentioned by many subsequent writers.

VII.

STOKE NAYLAND SUFFOLK
MAY 13TH 1836

SIR

As you had the kindness some two or three years ago, on my sending you a few specimens of Birds & nests with eggs, to offer me any Birds that I might wish to have from your district, I trust you will not consider me intruding in requesting you to procure for me one or two of the Tern species which you describe as breeding on the Northumbrian coast. I am anxious to obtain British specimens of Sterna Dougalii, Roseate Tern, with their eggs, which if you could obtain for me I should feel obliged; also with eggs of the Sandwich Tern: skins of the Birds I should prefer to mounted specimens. I killed on the 2d of this month a male bird of the Grey-headed Yellow Wagtail, M. neglecta of Gould, in this parish I believe it is the only authenticated instance of this bird occurring in these Islands.* Mr. Doubleday,† of Epping, has a bird, which he believes to be of this species, killed in autumn on the Essex coast last year;‡ but at that season they so much resemble our common Yellow species that it is difficult to distinguish them. I have also a specimen of the Pectoral Sandpiper, Tringa pectoralis, killed, on the most undoubted authority, on the borders of Breydon Broad near Yarmouth. A notice of it I perceive is given with a plate in a supplementary part lately published to Bewick's work by T. C. Eyton.§ The Bird attracted the notice of

* It was doubtless from the information contained in the present letter that notice of the occurrence of this bird, and of the Sandpiper directly after mentioned, was inserted in the *Magazine of Zoology and Botany* (i. p. 200), of which Selby was one of the editors.

† Henry Doubleday, F.L.S., a well-known ornithologist and entomologist, died at an advanced age in 1875.

‡ According to the original record (*Mag. Nat. Hist.* viii. p. 617) it was killed in 1834; but this may be wrong, as is also the reference to the volume which contains the notice (Yarrell, *Brit. B.* ed. 4, i. p. 560).

§ The first record of this specimen seems to be by Mr. Jenyns (*Man. Br. Vertebr.* p. 210). Mr. Eyton subsequently described and figured a foreign specimen (*Rar. Br. B.* p. 42). Hoy himself subsequently noticed it at greater length in 1837 (*Mag. Nat. Hist.* ser. 2, i. p. 216).

the person who shot it by its note: it was solitary, proved a female on dissection. Mr. Audubon has examined the specimen & pronounces it to be the T. pectoralis of the United States.

I am just leaving home for a visit of a few weeks to Holland & some parts of Prussia where I hope to meet with some of our rarer Water Birds, among the genus Tringa, Totanus & Podiceps, breeding: should I meet with specimens of eggs which may be desiderata in your cabinet, I shall have pleasure in presenting you with them.

I remain Sir your ob^dt. ser^vt.

J. D. Hoy.

P. J. Selby Esqre.
Twizell House near Belford
Northumberland.

VIII.

Redland near Bristol. Feb^ry. 9th [1831.]

Dear Sir,

I take the liberty of forwarding a bird* to you, which does not appear to have been recognized as a British species, and hope you will do me the honour of accepting it. It was killed

* This bird was undoubtedly the Hooded Merganser (*Mergus cucullatus*), first introduced by Selby to the list of stragglers to Britain, and the specimen, bearing Mr. Elton's name on the ticket, is still in the collection at Twizell. In connexion with this matter, some things are to be remarked. First, the fact that Elton, who (as his other letters to Selby shew) was a diligent collector of birds, should have given this specimen to Selby, when the mere loan of it would have answered the latter's purpose. Secondly, that a specimen of this purely American species should have been obtained by Elton with two of the as purely American species, *Tringa pusilla* or *T. minutilla*,--the occurrence of which in England had not then been recorded—said to have been shot at the same place. Thirdly, that the Merganser should have been preserved as a skin, without having been mounted—a most unusual thing at that period; and fourthly, that more than a year had elapsed between the time of the reputed occurrence of the bird and the transmission of its skin to Selby. All these circumstances combined tend to throw some doubt on the statement in the text.

at Yarmouth in the winter of 1829, & was purchased as a rare bird by the person from whom we have lately obtained it, who had it skinned by a bird preserver of the place. We are unfortunately ignorant of the sex and weight, as we received it in its present state, and its former possessor did not make any observation. I however venture to flatter myself that it may add to the British Fauna, as it appears to differ in many respects from the other Mergi, all of which I have compared with it. When you have leisure I should feel extremely obliged for your opinion concerning it. We also met with a pair of the Tringa Pusilla shot at the same place. I hope shortly, as the spring advances, to have the pleasure of forwarding some skins of the Lesser Whitethroat, & if possible some eggs, or should the season unfortunately prove unfavourable (as they are not always equally plentiful) I will not fail to procure them at some future time.

I remain Dear Sir

Your most obedient Servant,

JOHN W. ELTON.

To
P. J. SELBY, ESQ
TWYZELL HOUSE
NEAR BELFORD
NORTHUMBERLAND.

IX.

SIR

Mr. W. C. Hewitson* writes me word that you would be glad of a drawing of the Anas Stelleri shot near Yarmouth ;† &

* The well-known oological and entomological author, who died May 28th, 1878, aged 72, a memoir of him is given in *Nature* for 20th June, 1878.

† The occurrence of this specimen, the earliest of the species known to have been obtained in England, seems to have been first recorded by Yarrell in the *Magazine of Natural History* for March, 1831 (iv. p. 117); but announced the fact at a meeting of the Committee of Science and Correspondence of the Zoological Society, on the 25th January preceding (P.Z.S. 1831, p. 35).

it will afford me great pleasure to send you one. Before, however, I do so, I am desirous of knowing, of what size you would wish for the drawing, & how far you would desire it to be finished in an elaborate or rather in a sketchy style. I ask the latter question, presuming you intend it for your work, of which I am sorry to say I never yet saw a single plate: perhaps, therefore, in your reply, you would have the kindness to inclose me some one, no matter great or small, that I may have the draw^{g} made to correspond with it. I do not know whether you are aware that, just at the same time when this bird was shot near us, another specimen was taken at Copenhagen.* No third, I believe, has yet appeared in Europe. A French Naturalist† from whom I derived this information, offered my friend, who has our bird, as many as 100 French Birds in exchange for it. We had this very last week the good fortune to have a second specimen ‡ of the Ardea comata taken near us. Of this also I hope I sh^{d} be able to send you a drawing if you desire it. Indeed whatever this county supplies I would always send with pleasure. I sh^{d} only be doing a duty. To see you here would be a singular gratification to,

Sir,

Your very obedient servant

DAWSON TURNER

YARMOUTH 23RD MAY 1831.

— SELBY ESQ.

* This is confirmed by Kjærbölling, who says (*Danmark's Fugle*, p. 384) that a Steller's Duck was caught in a net by some fishermen of Gilleleie in Denmark, in the winter of 1829-30, and sent to the Royal Museum at Copenhagen.

† Most likely Delamotte, who is believed to have been about this time in Suffolk and Norfolk, and to have been the guest of Mr. Leathes at Herringfleet, near Lowestoft.

‡ According to Mr. Stevenson (*B. Norf.* ii. 152), this is now in Mr. Gurney's collection. Selby, in his note (*Ill. Br. Orn.* ii. p. 26), has possibly misunderstood the writer's meaning, whose *first* specimen would most likely be that known to have been taken in December, 1820.

X.

DEAR SIR

I have very much to regret that the delay in the arrival of your letter, which, having been sent by one of our colliers, reached me only a few days ago, has put it out of my power to do what I had wished & intended. My friend, Rev. G. W. Steward,* the proprietor of the Anas Stelleri, has just given it, together with the whole of his collection, to the Norwich Museum, so that it is no longer in my power to borrow the bird to have a drawing made of it; nor do I know any person at Norwich who could do it for me. As, however, the Museum already has a drawing made by one of my daughters, I have no doubt they would lend it to you, if such a loan w^d^ answer your purpose. And you will oblige me by replying to this question, so that I may know your wishes by next Wednesday, when I must go to Norwich to attend the Museum Committee, as their President. Together with the Western Duck, I am told that Mr. Steward gave the Museum a specimen of the Caspian Tern shot near us†; & I will inquire if a draw^g^ of it can be got. I am told also that the Little Egret has been shot by Yarmouth as well as at Wisbech,‡ & that two specimens of the Eared Grebe were taken this spring on Rollesby Broad about 7 miles from us. Both the Grebe & Egret are said to be in the hands of friends of mine hard by, in which case I shall have no difficulty in getting you drawings. I would have ascertained this point, but for the necessity of writing at once, lest I sh^d^ not hear from you by Wednesday.

The two specimens of Ardea comata, taken with us, are both males: one of them is gone to London to be engraved: the other is not at this moment accessible, being in the house of a gentleman

* This gentleman, the late highly-esteemed rector of Caister, near Yarmouth, died on 31st May, 1878. The collection of birds he presented to the Norfolk and Norwich Museum, as stated in the text, contained about one hundred and twenty specimens.

† No doubt that noticed by Messrs. Paget (*Nat. Hist. of Yarm.* p. 12).

‡ There seems to be no other contemporary notice of either of these specimens, but the Yarmouth one was most likely that said by Mr. Stevenson (*B. Norf.* ii. p. 150) to have been in Mr. Steven Miller's collection.

who is dying. I could not therefore get at them to make descriptions, were I competent; but, in truth I am not; for I must set you right with regard to my being an ornithologist, by owning that I have no further knowledge on the subject than a general love of Natural History has given me: specimens of Birds I have none.

I am, Dear Sir,

Your very faithful servant

DAWSON TURNER

YARMOUTH 19TH JULY 1831

P. J. SELBY ESQ.

TWIZELL HOUSE, NORTHUMBERLAND

XI.

DEAR SIR

I have a great many apologies to make to you, that, having been prevented by indisposition from attending the meeting of the Committee of the Norwich Museum in August, it was but yesterday I was able to procure the drawing of the *Anas Stelleri*. This I received only as a loan; & I must therefore beg the favor of you to return it when done with. At the same time, my friend, Mr Griffin,* sent me for your acceptance drawings of the *Ardea comata* & *Sterna Caspia*, both shot near Yarmouth. All the 3 therefore I have consigned to one of the masters of our coalships, addressed to the care of Mr Hewitson; & I shall be glad

* Richard Griffin was born at Norwich in 1806, and, entering the medical profession, became house-surgeon to the Norfolk and Norwich Hospital. Having a strong taste for natural history and especially for ornithology he planned an extensive work on British birds, from the publication of which he was dissuaded by Dawson Turner on account of its expense. As Secretary for nine years to the Norfolk and Norwich Museum, he greatly extended its resources and collections. In 1831 he contributed to the Royal Society a paper describing the mammary glands of the *Ornithorhynchus* thereby anticipating the researches of Prof. Owen, who is usually regarded as their first discoverer. He also published his rough-notes of this paper in *The Lancet* for July 18th, 1846, p. 79, which were followed by Editorial remarks upon it at pp. 105 and 162, and a letter by Professor Owen at p. 135. In 1841 he retired to Weymouth, where he died in 1869. A memoir of him is contained in *The Lancet*, 20th Nov. of that year.

to hear of their reaching you safely. I shall be still more glad if the two last, notwithstanding their small size, may be of any use to you. Larger, I am sorry to say, I have no chance of procuring; but I can get others, similar to them, of *Ardea alba** & *Ardea Garzetta*, also Norfolk specimens; & I will do so with the greatest pleasure, if you wish it.

I am
Sir
Your very faithful servant
DAWSON TURNER.

YARMOUTH 13TH SEP 1831.
J. P. SELBY ESQ.
TWIZELL HOUSE
BELFORD
NORTHUMBERLAND
Redirected "SIR WM JARDINE BART.
"JARDINE HALL
"LOCKERBY
"DUMFRIESHIRE."

XII.

LONDON JUNE 15TH 1835.

REVD. SIR,

I beg to thank you very sincerely for your most kind and friendly letter. I am aware of the existence of the fish you describe and you are perfectly correct in considering it a Bream and the Bordelieu of Shaw—the name he had from Bloch, who calls it also *Cyprinus blicca*—distinguishing it from the older and better known species the *C. brama* of authors.

The first notice of this second species of Bream as a British fish was made to the Linnean Society in 1824 by the Revd. Revett Sheppard in the following words—"There exist in the river Trent in the neighbourhood of Newark, two species or varieties of Bream. The common one *Cyprinus brama* is known there by the name of Carp Bream, from its yellow colour, and has been taken

* Most likely either that in the Miller, or that in the Thurtell collection, as stated by Mr. Stevenson (*B. Norf.* ii. p. 149).

of nearly eight pounds weight. The other species or variety, which I believe to be nondescript, never exceeds one pound in weight. It is of a silvery hue and goes by the name of White Bream."

Since that time I have ascertained that this second species of Bream, which is very well known on the Continent, is very abundant in some parts of the river Cam, where it is called by the fishermen the Bream-flat—and from the Cam I have received and still possess specimens—As my M.S. is four months in advance of the publication of the Hist. Brit. Fish. to prevent if possible any chance of delay or disappointment my account of this fish is already written but not yet printed, or in type and will appear in the 7th Part on the 1st of Sept. and I venture to presume that I am at liberty to make use of any part of the contents of your polite communication to improve my account—I shall give a figure of each of the Bream, and a scale also from the lateral line of two fishes of equal length to show the difference in size—those of the White Bream being the larger of the two, the eye is also larger—but the pectoral fin has three rays less, and the anal fin five rays less than in the Carp or yellow Bream—The names however are not wholly without objection—for both these Bream when young are white, and both equally flat.

The fish called by Pennant the Shallow of the Cam is the same as your Rudd or Roud, a name, given by, or perhaps I ought rather to say that will be found in Willughby's 'Historia Piscium.' The Germans call this fish Röth Oge,—it is the same also as the Finscale.

This fish is not uncommon in Lincolnshire and Yorkshire in Scotland and in Ireland, in which latter country it is called a Roach. You will find by and by some notice of your Norfolk Broads—Heigham Sounds and Horsey Mere, when I come to the Rudd and the Pike, and again thanking you for a new locality for and further information of this second species of true Bream I am

Sir, Your obliged and obedt. Servt.

WM. YARRELL.

RYDER STREET
St. JAMES's

THE REVD. RICHD LUBBOCK,
TOMBLAND,
NORWICH.

XIII.

LONDON JULY 3RD 1835.

DEAR SIR,

Urgent business has obliged me to be absent from home or your second letter and its accompaniments should not have remained so long unacknowledged—The examples of each of the species of Bream were very useful as shewing the differences in colour in the same species from different localities and the necessity as well as value of attending to characters depending on organic structure. Both the Bream were finer in colour than any specimens I had hitherto seen—the Roach was also in fine colour, and the water of these broads as well as the variety of soil over which they extend appear to suit these fish extremely well. The Tench were very fine also and very good and I beg you will accept my best thanks for them.

Your information enabling me to improve my account of the second Bream which was just going to press I have taken the liberty of mentioning your name in reference to the additional matter, which I hope you will not disapprove, if, however, you have any decided objection to your name being mentioned, pray make no ceremony, but let me know, and I will immediately alter it.

I have but one other little matter to notice. If you will do me the favor to send into Norwich on Sunday morning, and I chose that day as the one the most certain to be past by you near home, your messenger will find at the office to which the Norwich Magnet night Coach from Charing Cross runs, a basket containing some fish which I will see sent off on the Saturday (to-morrow) afternoon—

I am, Dear Sir
Yours very truly
WM. YARRELL.

RYDER STREET
ST. JAMES'

REVD. R. LUBBOCK
TOMBLAND.

XIV.

My dear Sir,

Having seen the first number of your work on British Birds, which I am sure will be valued as it deserves by every Naturalist, I write to say that at any time if you want any enquiries to be made here for you, as to the appearance of the rarer birds or any point of local ornithology, I shall esteem it not a trouble but a pleasure to be entrusted with your wishes. Fen birds, as you are well aware, we have here in greater quantities, than most parts of England can boast of. Being very much in the marshes and upon the broads, I have from time to time noted down such facts as have come within my notice, and, as I said before, if I can in the slightest degree assist you in a work which will be generally prized, the doing so will confer great pleasure upon, Dear Sir,

Yours very truly

Rich^d. Lubbock.

Bramerton. N^r. Norwich.
July 13th. 1837.

W. Yarrell, Esqre
Ryder St. S^t. James^s
London.

XV.

London July 21st. 1837.

Dear Sir,

I am greatly obliged by your friendly letter and favorable opinion of the first part of the British Birds and hope you will accept my best thanks for your kind offers of service — I am aware that many valuable facts are to be observed and gleaned in your locality and have on that account purchased when it was published a sketch of the Natural History of Yarmouth and its

neighbourhood by the brothers C. and J. Paget,* one of whom being a surgeon in London, or, as I ought perhaps rather to say, learning his profession, calls on me occasionally. As my history must be general rather than local, and as I must not exceed two volumes and therefore limit myself to an average of four pages for each bird, I am unable to dwell much on local peculiarities, but if you can furnish me with the names of any birds visiting your country not in the Messrs. Paget's Catalogue—or a notice of the repetition of the occurrence of any that are rare I shall be very much obliged.

I have the pleasure of being very intimate with your newly made Bishop of Norwich the Rev^d. E. Stanley,† who as well as being a most excellent man, is devoted to Natural History. In a conversation with him on Wednesday morning last I mentioned your name to him as an observer of Nature in his diocese, and the first time you meet him he will be desirous of hearing from you an account of all the Birds and Fishes that visit or inhabit the Broads. In some future letter I shall hope to hear that you have been his pilot in a boating expedition against sundry giant pike, and I am sure he will enter into the spirit of such an enterprise and enjoy it highly.

* The above-mentioned work, which is to this day, a chief authority on the fauna and flora of Yarmouth and its neighbourhood was published by the brothers, Charles John, and James Paget, of that town, in 1834. The former died at Yarmouth in 1844, and is buried with other members of the family in St. Nicholas' church: closing a promising career at the early age of 32. The latter it is only necessary to mention, briefly, as the present Sir James Paget, Bart., F.R.S., &c. &c.

† Edward, second son of Sir John Thomas Stanley, and brother of John Thomas first Lord Stanley of Alderley, born 1779, consecrated Bishop of Norwich 1837, for many years President of the Linnean Society and of the Norfolk and Norwich Museum, died 1849. Best remembered by naturalists as the author of *A Familiar History of Birds*, which in many passages shews him to have been a most accurate observer. His eldest son, Owen, a Captain in the Royal Navy, whose promising career was prematurely closed in 1850, commanded H.M.S. 'Rattlesnake,' in 1846, on her surveying voyage in the Australian seas, which will always be memorable as being the means of developing the genius of Prof. Huxley, who served on board as Assistant-Surgeon. Capt. Stanley, through his father, was a considerable benefactor to the Norfolk and Norwich Museum, many specimens of Australian birds presented by him, in 1848, having since been identified as of great rarity, and one or two of them are almost unique in collections.

But not to forget your kindness about Birds, pray send me at your perfect convenience any thing you think I ought to know, or the history ought to contain about them.

I am, Dear Sir,
Yours very truly
WM. YARRELL.

RYDER STREET
ST. JAMES

THE REVD. RICHARD LUBBOCK.
BRAMERTON, near NORWICH.

XVI.

BRAMERTON MONDAY AUGT 7. [1837].

MY DEAR SIR.

I thank you for your Letter. I was glad to find that you had already seen the Messrs. Paget's work on the Natural Histy. of Yarmouth. It is a most useful and accurate book; if it has a fault, it is that uncommon one of being too short. I have sent you some extracts from notes which I have made at different times, not that I am presumptuous enough to think that I can give you any new information. I found I had memoranda of the repetition of some scarce birds. In one or two instances, the Grey Lag Goose, for instance, I have continued to differ in opinion from Messrs. Paget; * you will find a list of the birds mentioned in the first page of the MS. I send with this. I also have packed up some memoranda which I made recently from the household accounts of a

* The opinion expressed by Messrs. Paget was that generally accepted at the time, but now found to be incorrect, namely, that the Grey Lag was very common, and the Bean Goose less frequently met with. There doubtless was a time when it was true, but that must have been very long ago.

Norfolk family of distinction.* They bear the same date nearly as the Northumberland household Book—and give some precise information as to the price of different birds &c. There is also a fact which I think is curious, six rabbits are mentioned as killed by the Sper Hawke, (Sparrow Hawk) I always supposed that the Partridge in days of yore was the utmost quarry which even the female Sparrow Hawk could master. I thought that by sending you the extracts which I had already by me, I might save you the trouble of looking thro' many pages which contain nothing touching upon natural history being merely house accounts. I had as you will see two or three notes of the occurrence of the Little Bittern, besides those which Mr. Paget mentions. The Mr. Girdlestone mentioned in his work was the dearest and most intimate friend I ever had, and, were he now alive, I might perhaps have been able to send you some memoranda more worth your perusal than I now can.

If you want enquiry to be made in our district as to the occurrence of any particular birds, be so good as to point them out, and I will do whatever I can.

At your leisure I should be very much obliged if you would send me *your own* opinion as to the occurrence of the Scolopax gallinula in Britain during the breeding season. Norfolk is a "Snipe country," and I have stated all that I have been able to observe upon this little bird.

Some few birds are so local, that to observe their habits a journey must almost be specially made—perhaps I could on this head be of some trifling use to you, if so, I beg you will send me word what birds' "life and conversation" you would wish me to attend to. We have heard in this diocese but one character of your friend the present Bishop of Norwich, that he is in every respect fitted for the station he is called on to fill. Believe me Dear Sir

Very sincerely yours
R^D LUBBOCK

* "The Household and Privy Purse Accounts of the L'Estranges of Hunstanton, kept during the reigns of Henry VIII. and his children, from 1519 to 1578," communicated to the Society of Antiquaries by Daniel Gurney, Esq., F.S.A., of North Runcton, near Lynn, in 1833, and published in vol. xxvi. of the *Archæologia*.

I have sent also a few observations made by Mr. Salmon,* a very accurate observer, on birds in the vicinity of Thetford.†

W. YARRELL ESQRE.

XVII.

LONDON AUGT. 16TH. 1837.

MY DEAR SIR,

I have delayed acknowledging the receipt of your packet much longer than your kind letter and valuable communication deserved, but I have been waiting for an artist and the enclosed drawings of two eggs must be my excuse. The information contained in the two parts which you have yourself written out are very acceptable and I am greatly obliged. Let me know if you wish the MSS. to be returned, and if so, I will copy them forthwith. Mr. Salmon's printed remarks will be useful. I be-

* John Drew Salmon, F.L.S., a well-known oologist and botanist, who lived for some years at Stoke Ferry and Thetford (4 years), in Norfolk; afterwards at Godalming, in Surrey, and finally in London, where he died in 1859. He bequeathed his cabinet of eggs to the Linnean Society, but unfortunately its contents were shamefully plundered before it came into the Society's possession. To the Norwich Museum, of which he had long been an honorary member, he left his extensive and valuable herbarium, comprising two collections beautifully arranged and named, one possessing a special local interest, having been formed in this county. To these were added several important botanical works, some of which being interleaved with notes and references to his collections, are an important addition to the bequest. Shortly before his death he had also presented the Museum with some 300 specimens of British birds' eggs, to which his brothers, Captain J. C. and Richard Salmon, added a further series of duplicates (and nests), from their fine collection. His diaries, consisting of ornithological and botanical observations, made between 1825 and 1837, whilst a resident in Norfolk, are preserved in the Norwich Museum. From these records it appears that he visited Holland in the summer of 1825, but not for egg-collecting which pursuit he only commenced in 1828, with his brother Richard; and to this end he visited the Isle of Wight in 1829, the Orkneys in 1831, and Lincolnshire in 1832. Of his expedition to the Orkneys, from May to July, he subsequently published an account in the *Mag. of Nat. Hist.* (v. p.p. 415—425).

† Afterwards printed in the *Mag. of Nat. Hist.* (ix. pp. 520—528).

came personally acquainted with him when he was last in London, a few weeks since.

I have never yet seen *proof* that the Jack Snipe breeds in this country. I have found the old birds as late as the second week in April, but they left the ground afterwards. I have had the common Snipes eggs from 4 or 5 different counties, but never could get those of S. gallinula, and I am of your opinion that the eggs usually exhibited as those of the Jack Snipe, are in reality only those of the Purre. Some Yorkshire ornithologists have told me that a nest of the Jack Snipe, containing 4 eggs has been found in that county and that two out of the 4 eggs are still preserved in the collection of Col^l. Dalton. In his notice of Birds observed in Sutherlandshire, published in the 3rd. volume and 4th. report of the British Association Mr. Selby says at page 612. "Scolopax gallinago abundant Scolopax gallinula is also said to breed near Tongue, but we did not meet with it."—In the collection of eggs at the Jardin des Plantes in Paris are eggs labelled as those of the S. gallinula. When I was there in 1823 I obtained leave and had drawings made from this and several others that were rare and not likely to be met with in this country. From the drawing there made, the olive-coloured egg on the enclosed card is an exact copy, made for you, and as I find by your remarks that you look closely into eggs—you will perceive the Snipe character which pervades this representation.

I have in a small collection of American eggs three examples of the egg of Perdix virginiana or Ortyx v— as it is now called—one of these I will send you by the first opportunity that occurs to me in the mean time the white egg on the paper is taken from one of these three, and may serve you as a point of comparison. I have no doubt the numerous white eggs you refer to are the eggs of this bird. Mr. Thornhill of Suffolk* turned out a large quantity—they strayed away and several have been shot, as I have been told, in different parts of Suffolk and Norfolk. This bird lays as many as 16 eggs, and I remember 3 or 4 years ago Mr. Leadbeater the Bird

* This no doubt refers to the Mr. Thornhill of Riddlesworth, who died in 1844. As mentioned by Mr. Stevenson (*B. Norf.*, i. p. 437), that gentleman had a pair stuffed which were killed in Norfolk, but the fact has not been hitherto recorded that this Mr. Thornhill turned any out. As he and Yarrell were very intimate, the latter's statement is very likely true.

Preserver received 4 of these birds in beautiful feather from a sportsman who had met with them wild (where I did not learn) and for whom the four were preserved in one case in different attitudes and formed an interesting group.

I have no doubt you are correct about the true Wild Goose. The proportion of Bean Geese to the Grey Lag, as far as my opportunities of observation have gone, are at least as 100 to 1. Some years ago, I had a weeks Partridge-shooting in the vicinity of Swaffham, and on one day I walked with the late Philip Hamond while he shot, at Westacre—on that occasion we saw a flock of Geese of several hundreds: by what means I do not now recollect, but we got one—and tho' called a Wild Goose—it was Anser segetum. The late Robt. Hamond used to call here when in London to talk over novelties in British ornithology.

The male of the Little Bustard only carries his black feathers on the neck during the breeding season—and the Dusky Grebe of authors is the winter state of Podiceps cornutus. I have not found Spowe* in any Dictionary or Glossary; but I shall continue my search, and enquiry and will report if I am successful. Rabbits killed by a Sparrow Hawk is a new fact to me. I have 2 or 3 times dissected the Porpoise, and on one occasion when the subject was young and very fresh, I found the flesh excellent meat, dark in colour and large in fibre, but of excellent flavor, very tender and full of gravy. If you make the experiment yourself, it is desirable to cut the muscular part off quite clear of any of the subcutaneous layer of fat. How birds manage to cover their eggs so suddenly I will endeavour to explain in a future letter.

I am, Dear Sir

Yours very truly

Wm. Yarrell.

Ryder Street
St. James's—

[The drawing accompanying this letter bears on the back "Chas. M. Curtis, del. Augt. 1837," and represents two eggs. The upper figure purporting to be that of the Jack-Snipe, can not have had an egg of that species for its origin, but most likely a Dunlin's. The lower figure is a very correct likeness of the egg of the Virginian Quail.]

* Messrs Gurney and Fisher suppose that the "spowe," of the Lestrange MSS. was the Whimbrel, and since the Icelandic name of that bird is *Spoi*, there can be little doubt some species of wader was intended (*cf. B. Norf.*, i. p. 213, ii. p. 201).

XVIII.

ECCLES NR. LARLINGFORD—
[DECR. 11TH. 1837]

MY DEAR SIR—

I have delayed answering your letter for a very long time, having been busied in moving from one part of Norfolk to another. I shall I trust be stationary here, having been presented to the Rectory by my friend Sir T. Beevor*. With respect to the memoranda I sent to you, I rejoice that they were in any degree useful—do not, I beg, take any trouble of copying, or returning them. Should any other facts occur to me I will send you word. I trust ere long I shall come to London to spend a few days with a friend, when I anticipate the pleasure of calling upon you.

Believe me, Dear Sir,
Very truly yours—
RICHARD LUBBOCK.

I think from what an old fisherman has stated to me, that your Anguilla mediorostris, Snig Eel, is to be found in some localities in Norfolk, he calls it the Glazed Eel, or Michaelmas ditto.

W. YARRELL ESQRE.
RYDER ST. ST. JAMES'.

XIX.

ECCLES NR. LARLINGFORD.
NORFOLK.

MY DEAR SIR.

I recently met with two papers upon the birds and fish which were formerly to be found in the Norfolk fens, which I think you might like to glance over. You will find them in the third or fourth vol. of *Wilkins'* edition of Sir Thomas Browne's

* Sir Thomas Branthwaite Beevor, Bart., born 1798, who now resides at Yarmouth, succeeded his father as third Baronet in 1820. He married a daughter of Richard Lubbock, M.D., of Norwich, and was consequently brother-in-law to the writer of the above letter.

works, they are a new addition to his works, the originals are among the Sloanian MSS. That on the birds especially is curious, he mentions a community of Spoonbills which bred in his time at Trimley in Suffolk and states that the Cormorants which were reclaimed and used for fishing, "There being a master of the Cormorants in those days annexed to royalty" had their numbers recruited from time to time from a particular spot in Norfolk which he mentions. He speaks of abundance of Eagles in the marshes, and of the large dimensions of one which he had as a pet. By his account they would seem as common then as the Marsh Harrier has been of late years. There is much curious information in a small compass, and the high character of the author as a naturalist and philosopher, renders it very interesting. It is also valuable as treating of a period long past concerning which there is little direct information. I think Sir T. Browne died in 1700.* I have to apologize for the vague account I give you of the vol &c. I made a mem^m. of the precise page at the time of reading, but have had workmen in my house, and all my books being put away, have searched for it in vain Should you find any difficulty in procuring the book or finding the passage pray send me word, and I will make an extract for you when opportunity serves. The common Stork, Ciconia alba, Linn., has occurred 3 times in Norfolk during the last two years and precisely at the same time of year the beginning of June, an adult Male was killed at Wretham, very near to where I am now writing, in 1838, and two more fine specimens at Sutton in this year. I beg to thank you for your kind mention of the trifling assistance I have been able to afford you I feel an honest pride at seeing my name in such a work. Wishing you every success in your valuable labours I remain Dear Sir very Truly yours R^D. LUBBOCK.

W. YARRELL ESQ^R.
CARE OF MR VAN VOORST
No 1. PATERNOSTER ROW LONDON

* Sir T. Browne died in 1682.

[Bears the Attleborough post mark of June 17, 1840 : endorsed by Mr. Yarrell "Rev^d. Rich^d. Lubbock June 18th. 1840."]

XX.

ECCLES JULY 30TH [1840]
NR: LARLINGFORD.

MY DEAR SIR.

I should have answered your letter ere this time but have been a good deal about from home. I think with you upon referring to the original document that Spowes must be Sparrows abbreviated. With regard to the origin of the term Stynt or Stint, I think a *strong case* as a Lawyer would say, might be made on either of your suggestions, but I am rather inclined to favor one in preference to the other. I think rather that formerly when fen birds appear to have been more generally prized than at present, it got its name from being the smallest of a bunch of birds brought in by the fowler, Curlews, Godwits, Ruffs and Reeves and Knots, appear to have been of much value and the smallest of these is considerably larger, and as every thing in this world is great or small by comparison, I dare say Stint sprung from hence. I was very much interested by your account of the Great Bustard. It is now so rare in Norfolk that we have not a specimen in our county Museum, which has a very fair collection of British Birds. One particular bird I have remarked of late years to have decreased in numbers wonderfully. The Hooded or Grey Crow used to be abundant in winter. I am quite sure there is now scarcely one where twenty years ago there were a dozen, and I cannot see any reason for this great difference,* seeing that it is worthless to eat, and visits us from regions where it is unmolested by Gamekeepers. The decrease in wildfowl may be accounted for by improvements in gunnery all over the world and the system of taking eggs wholesale as mentioned by Audubon and others.

Believe me Dear Sir
Most sincerely yours
RD. LUBBOCK.

W. YARRELL ESQR.
RYDER ST: ST. JAMES:
LONDON.

* There must have been some misapprehension here on the part of the writer. No one else has observed any such decrease as regards the Grey Crow.

XXI.

ECCLES NR. LARLINGFORD
SEPR. 14TH. [1840]

MY DEAR SIR.

I wrote to you some time ago upon what I had been able to observe of the habits of the Green Sandpiper (Tringa Ochropus, Linn.) after observing them in the neighbouring streams for two or three seasons continuously. I am nearly certain that they remain here all the year, with the exception of that period in spring and early summer in which they withdraw to hatch and rear their young. I have shot them in extremity of frost, and have always seen one here and there during the Snipe shooting in March but the 11th. of April is the latest time in spring in which I observed them. this year I asked my Nephew, who is often about the rivulet, looking for fish or shooting rabbits, to let me know as soon as he perceived them return. On July the twenty third he told me that he had seen six together, and on the twenty sixth of the same month, I found them near the place he had mentioned, by creeping on my hands and knees I obtained a near view as they walked about on a mud bank, and believe from the duller look of the plumage of some, that they were two old birds with a brood of young ones. They appear to separate soon after their arrival, or to unite for a day or two as fancy leads them.

Very little specific has b[een sa]id by any British Naturalists as far as I am aware upon the habits or the migrations of this bird, which was my reason for sending you this.

Believe Me Dear Sir
Yours sincerely
RD: LUBBOCK.

W. YARRELL ESQR.
RYDER ST. ST. JAMES.'
LONDON.

XXII.

ECCLES NR: LARLINGFORD
AUGT. 27TH. [1841]

MY DEAR MR YARRELL

I see by the last number of your British Birds, that you, justly no doubt, account the egg of the Water-Rail, a rare one—I happen to have by me seven which with the nest I took four or five years back from the margin of a small swampy pool, in Norfolk diction called "a pulk hole" on the edge of one of our broads. I was first attracted four or five days previously by the *very loud cry* of the Rails. I did not then know what bird's note it was, on asking the boy who was helping me in the boat he said it was the noise of the Rail when nesting. I told him as he lived hard by to keep a keen look out, and if he found the nest, not to take it but to let me see it in its natural position. I ought to have the said nest still, but have been searching half the morning in vain, otherwise you should have seen it. I saw the hen go from her nest when I took it, and there were inside, three or four of those peculiar barred white and black feathers which the bird wears. The nest was very like that of the water hen, but smaller and the rushes of which it was made smaller and more delicate. It was just raised from the damp ground and placed between two of those high clumps, which often stand up above the rest of the marsh. I send you three of the eggs, the bird had sat a day or two when the nest was taken. They have, I think, faded somewhat. I send with them one of the eggs concerning which we corresponded some time ago, nest found in a marsh at Barton, twelve or thirteen eggs in it. You were so good when I was in town as to say that you would give me specimens of the eggs of the Fieldfare. If you can do so I shall receive them with gratitude.

Believe me
Yours very Truly
RD: LUBBOCK.

XXIII.

ECCLES
Nr. LARLINGFORD
Novr. 20. [1841]

MY DEAR SIR

I thank you for the Fieldfares' and Redwings' eggs, when I saw you in the spring I told you that I would, if possible, send you some notes from a gentleman* who is a practical decoy man relative to the [m]anagement of decoys. I now enclose them and shall be glad if they prove of any use to you. You will observe that he speaks of a small extent of water, three or four acres, the reason is this if confined in extent you can almost always *work fowl* but if a large lake is made a decoy. there may be thousands of Ducks on the water but none near enough to a pipe to regard the dog or the decoy Ducks.

Yours very sincerely
Rd: LUBBOCK

W. YARRELL Esqr.
RYDER ST. St: JAMES's
LONDON.

* This evidently refers to the late Mr. John Kerrison who died at Ranworth on the 12th of September, 1866. He was, in early life, a midshipman, and afterwards junior officer in the East India Company's service, from which he retired, on his marriage, and from the commencement of his residence at Ranworth Hall in 1838 (the estate having come down to him through his grandfather, John Kerrison, lord of the manor of Ranworth and Panxworth); devoted himself, most successfully, to agricultural pursuits and the enjoyment of field-sports, in most of which his skill was only equalled by his enthusiasm. He restored and greatly enlarged the decoy at Ranworth, and, in this little known and peculiar, art his proficiency (from whatever source acquired) was second only to that of the shrewdest "professional" from the fens of Lincolnshire. Indeed, his old friend and fellow-sportsman, Lubbock, in treating of decoys in his *Fauna of Norfolk*, admits that to Kerrison who "worked his own decoy," he owed whatever insight he had into the system.

IV.

WILLIAM ARDERON, F.R.S., AN OLD NORWICH NATURALIST.

By F. Kitton, Hon. F.R.M.S.

Read 29th January, 1878.

One of the most important services that can be rendered by local Natural History Societies, is the preservation of the memories and labours of the humbler workers in the field of biological science, especially of those who "once dwelt in our midst."

Many painstaking observers have left no published record of their labours: they neither wished for nor expected the luxury of seeing their name in print, and their written memoranda were no doubt destroyed after their death, and we only know of their existence by the occurrence of their names in the books of their more celebrated co-labourers, noticed generally after this fashion: "The ingenious Mr. So and So, of Norwich, sends me the following account, etc."

The subject of the present memoir has however been more fortunate, as he contributed largely to the Philosophical Transactions, through the medium of his friend Mr. Henry Baker. Of his private history I have been able to learn little more than that given in 'A General History of the County of Norfolk' (by Chambers), printed by and for John Stacy, Norwich, 1829. In his 'History of Norwich Worthies' occurs the following notice of William Arderon, F.R.S. (vol. ii, p. 1307).

"William Arderon, F.R.S., born 1703, was not a native of Norwich, but came from Yorkshire, in the capacity of an officer of excise. His natural ability soon discovered itself, and introduced him to the notice of Dr. Buckenham, Alderman Wiggett, Alderman Rogers, Mr. Norris, and several other gentlemen, who it is supposed

in order to retain amongst them so valuable an auxiliary in their pursuits, obtained for him the situation of managing clerk at the New Mills: through these gentlemen he was introduced to Mr. Henry Baker, F.R.S. and A.S., who published in 1743 and 1745, his works on the Microscope,* in two vols. 8vo., to which Mr. Arderon largely contributed, his papers on subjects of Natural History are varied, and abridgments of which are to be found in the 'Transactions' of the Royal Society.

"Dawson Turner, Esq., who is in possession of his correspondence [now in the British Museum] with Mr. Baker, considered him an extraordinary man, and considering the difficulties he had to struggle with, certainly superior to Gilbert White, author of 'The Natural History of Selborne.'"

He died in 1767, after a long and painful illness, and was interred on the north side of Heigham churchyard. Within the church is a mural tablet with the following inscription:—

"In the churchyard
at the back of this monument are deposited the remains of
WILLIAM ARDERON, F.R.S.,
who departed this life November 25th, 1767, aged 64,
together with those of Susan his first wife,
and William their Son,
the former of whom died June 20th, 1759, aged 47,
the latter August 14th, 1748, aged 17,
and also Sarah his second wife, who died January 18th, 1762,
aged 31."

Mr. S. Woodward also adds his testimony to the abilities of W. Arderon. "He was a man of great natural abilities and research, as his journal in my possession evinces. [This journal cannot now be found.] To him we are indebted for the theory of the subsidence of the German ocean."

To this very meagre account I can add but little. In one of his letters to the Royal Society dated July, 1746, he says, that "This insect [the cockchafer] to his own knowledge had been more or less common in Norwich for the last twenty years," consequently he could not have been more than twenty-three years of age, and probably younger, when he commenced his duties as an officer of

* *Employment for the Microscope*, and *The Microscope made Easy*.

excise in this city. His appointment as manager at the New Mills must have been about 1729, as the rules of the Excise at that time did not allow of a longer residence than four years in the same locality. At this time he marries his first wife who would then be seventeen years old (his own age being twenty-six years), and she dies at the early age of forty-seven. We have no evidence of the date of his second marriage; but supposing that the usual time elapsed between the death of the first Mrs. Arderon and his second marriage, it would have been in 1760 (she then being twenty-nine and himself fifty-seven), she dies in 1762, he surviving her five years.

In the articles of agreement with the New Mills proprietors the following passage occurs:—"And the said proprietors for several years last past have employed the said William Arderon as their clerk and bookkeeper; and he having hitherto discharged the trusts reposed in him to their satisfaction, they the said proprietors have agreed with the said William Arderon to continue him the said William Arderon in their service as their clerk or bookkeeper, from the twentyfifth day of December last past for the term and time of twenty years. . . . . And for his care and trouble the proprietors agree to pay him the yearly sum of £60, and to provide him with a suitable dwellinghouse." The date of this agreement is January, 1750.

He was probably made an F.R.S. about 1743, and between that period and 1750 he contributed twenty papers to the 'Transactions,' all of them clearly indicating him to have been a man of acute powers of observation.

As it is now of more interest to know what he did than what he was, I propose to give some extracts from his published papers, and also from some unpublished MSS.: for the latter I am indebted to Mr. James Reeve, the Curator of our Museum.

As stated in the brief notice of his life, his microscopic observations were published in Baker's works on the microscope, who also copied his original figures, Arderon being a very fair draughtsman, as I think you will admit, on inspecting the drawings I have now the pleasure of placing before you. His papers in the 'Transactions' are arranged under various heads, and not in accordance with their dates.

The first paper to which I will call your attention is a description of an hygrometer: it will be found in vol. x, page 453 of the

'Transactions,' read February 27th, 1745. "A description of an hygrometer." A thin piece of sponge so cut as to contain as large a superfices as possible. This hangs by a fine thread of silk upon a beam, and is exactly balanced by another thread of silk strung with the smallest bird-shot at equal distances, and so adjusted as to cause the index to point at the middle of the graduated arch, when the air is in a middle state between the greatest moisture and the greatest dryness.

In December of the same year he forwarded through his friend Baker a description of an improved "weather cord." This improvement displays considerable ingenuity. It consisted of a rack attached to the centre of the cord, on which worked a toothed segment fixed to the shorter arm of an index, the contracting and relaxing of the cord causing the index to rise and fall.

On January 23rd, 1750, a splendid aurora was seen in Norwich and all over the county; and Mr. Arderon sends the following minute description of it to the R.S. "The wonderful appearance of the *aurora borealis* on January 23rd last, have been taken notice of in most parts of England, though in different forms. At Norwich, I believe, it was as extraordinary as at any place whatever, but the weather being very cold, and myself being somewhat indisposed, I did not make all the remarks I could have wished; the few I did make are as follows:—This wonderful *aurora* began at six in the evening, with a blackish cloud in the N.E., out of which sprung a streak of scarlet coloured rays of a surprising beauty and vividness. This presently extended to within a few degrees of the S.W. horizon, passing directly through the zenith, and so continued near a quarter of an hour, when red and yellow columns began to rise upward from every quarter. At seven a black cloud rose up in the S.E. and quickly put on a semicircular form, with light yellowish vapours ascending out of its upper edge and representing a glory of uncommon brightness. At eight the black cloud was dispersed, but the yellow glory remained, and round that sprang up another circle of red which made the whole appear very tremendous. The reddish streams, as well as this last mentioned circle, were sometimes so dense that the stars of the first magnitude could not be seen through them. The night was full as bright as it is when the moon is eight days old, but I could not compare it to neither the light of the sun nor moon, some of

the original colours seeming to be wanting, and the best description I can give of it is to liken it to that light produced in a dark room when one of the seven original colours is separated from the rest after they have passed through a prism, and been collected together again by a convex lens. This evening the barometer was 30·1 and falling, Hawkesbee's thermometer 63°, wind E., $\frac{2}{10}$ force. The morning misty and very cold, but all the day clear. Mr. Jos. Sparshall of Wells also send a description of the aurora, as seen by him in that town."

On the 7th of June, 1750, Mr. Arderon reports on a shock of earthquake felt in and near Norwich. Mr. Baker reads the substance of it to the Fellows of the Society. "Mr. Arderon writes me word from Norwich, that on Thursday last the 7th instant, as he and a friend were walking to take the air a little to the W. of that city, they heard, about seven in the evening a kind of hollow noise as loud as that of a large cannon, which noise was once repeated nigh the same place as an echo, and then continued dying away as it were for about half a minute. They saw no lightning, nor any clouds, except a few thin whitish ones in the western horizon. It was heard, he says, by great numbers of people in the city of Norwich, notwithstanding the great hurry and bustle there. Arderon received accounts of the supposed earthquake from Swanthorpe [Swainsthorpe], six miles S.E., and from Racka [Rackheath], four miles N.E. of Norwich, agreeing with the preceding description. He did not learn that any person observed any tremor of the earth, and confesses that his surprise was so great he did not know whether there was or not." The noise was probably occasioned by the bursting of a large meteor.

In a table of the temperature in the hot July of 1750, he says, that the hottest day was on July the 11th, when his thermometer (Hawkesbee's)* stood in the morning at seven, 19°. Evening 2. 8½° = 1026 Reaumur = 83 Fahr.†

"On Wednesday the 11th which was the hottest day of all, my thermometer in the sun's rays stood 11° above the heat of human

* I have endeavoured in vain to ascertain the divisions on the Hawksbee thermometer.

† Here is evidently an error either of Arderon's or the R. S. reports. 83 Fahr. = 22.66 Reaumur.

blood, and in the shade of my house only 8° below it. The distance between freezing and the heat of human blood being divided into 100 parts."

[The heat of human blood is generally estimated at 90° Fahr.: his sun temperature would therefore only be $96\frac{1}{5}\frac{2}{5}$° Fahr., and that in the shade $85\frac{2}{25}$°. In the 'Gentlemen's Magazine' for 1750, the excessive heat of this month is thus recorded. "The excessive heat of July 13th and of the preceding days so affected the fish in the Thames, that they gathered in shoals to the bank side, and buried themselves in the ooze and mud, and were easily taken in great quantities. Loads of fish perished in the fens of Cambridgeshire, and one person lost £300 by the death of jacks and pikes."

The following was the daily temperature of this hot week in London :—

Temperature on	Monday	the 9th	25°	Reaum.	= 88°.25	Fahr.
„	Tuesday	10th	21°	„	= 79°.25	„
„	Wednesday	11th	35°	„	= 110°.75	„
„	Thursday	12th	27°	„	= 92°.75	„
„	Friday	13th	31°	„	= 101°.75	„
„	Saturday	14th	35°	„	= 110°.75	„

The deaths in London	for the week ending	July 3rd	were	343.
„	„	10th	„	336.
„	„	17th	„	553.
„	„	24th	„	356.

showing a startling increase in the number of deaths owing to the excessive heat. The average number of the 1st, 2nd and 4th week was 345, the hot week shows an excess of 208 over the average. This intense heat was followed by severe thunderstorms.]

"On June 24th and 25th, 1745, a severe storm of thunder and lightning happened at the city of Norwich and the places adjacent. At Horseford, a small country village about four miles N.W. of this city, a remarkable phenomenon appeared the next day, the like whereof has not been observed in this county since that communicated to the Royal Society by Mr. P. Le Neve. A sudden *lapsus* or sinking down of the earth, happened at this village in the night above mentioned, and left a hole 12 feet deep and 12½ feet in diameter, in form almost exactly round, its sides nearly perpendicular, and what seems most strange, no ruffles, cracks, or chasms, are to be found nigh it."

The following observations on the precipices or cliffs on the N.E. sea coast of Norfolk, read at a meeting of the Royal Society, on November 20th, 1746, will doubtless be of interest to the members of the Norfolk and Norwich Natural History Society, in 1878. "July 19th, 1746. I had the pleasure of seeing those stupendous and amazing precipices which bound our N.E. sea coast, and rode four miles between them and the sea. I can assure you I was highly delighted with viewing them, and as Sir Richard Steele says by the Dover cliffs, 'Whoever looks upon these precipices and is not moved with terror, must either have a very good head or a very bad one.' These dreadful heights are equally dangerous to come nigh, above or below, as they are so frequently tumbling down and as often washed away by the raging billows, and although they are twenty, thirty, and in some places forty yards and upwards in perpendicular altitude, yet I am credibly informed, the sea has got of the land at least 110 yards in less than twenty years' time for some miles along the coast.

"The various *strata* which make up this long chain of mountainous cliffs, must be greatly entertaining to every one who takes pleasure in looking into the many changes which the earth has undoubtedly undergone since its first creation. Vegetable mould, oaz, sands of various kinds and colours, clay, loams, flints, marles, chalk, pebbles, &c., are here to be seen at one view, beautifully interspersed, and frequently the same kind many times repeated, as if at one time dry land had been the surface, then the sea, after morassy ground, then the sea, and so on till these cliffs were then raised to the height we now find them.

"What makes this come up almost to demonstration, are the roots and trunks of trees which are to be seen at low water in several places on the coast near Hasborough and Walket [Walcot].

"With respect to the fossil tooth I sent some time ago, I could trace nothing more out than what I had before informed you, but that bones of animals are often found here is undisputably true, and I have now by me another tooth of elephant, found betwixt Munsly and Hasborough. [In a foot-note, he says, "the tooth was much more decayed than that I before sent you, and hath several pieces broken off, yet it weighs 10½lbs."]

"That the reason why the rest of the bones of these animals are not preserved so commonly as the teeth, I am informed is, their

prodigious bulk and weight, which are so great that the country people thereabout have never thought it worth while to save them from the fury of the tempestuous waves.*

"After giving you a short account of what I thought worth my notice on our N.E. coast, I shall here lay before you what I have observed in some marl pits at a place called Cantley White House, about three miles from Norwich almost S.E. and adjacent to the country seat of the Honorable Thos. de Vere, Esq. These marl, or rather chalk pits are made in the side of a long chain of hills which run alongside the river Yar, or about a furlong or two now and then distant from it. [Mr. Arderon must have meant Whitlingham, which is three-and-a-half miles from Norwich. Cantley is ten miles distant, and moreover has no hills.] These hills I take to have been formerly the boundaries to an arm of the sea which made Norwich a famous sea-port: this some of our antient historians make mention of as an undoubted truth, tho' now looked upon as a fable, as no footsteps [*sic*] remain above ground at this day. In the above-mentioned marl pits I have lately discovered a stratum of shells of about two feet thick, running nearly parallel to the horizon, and I believe nigh level with some parts of the ground in Norwich. This seems to put the matter out of all dispute, and fairly confirms our ancient history. [In some notes to this paragraph he quotes from the 'Mercurius Centralis,' by the Rev. Thos. Lawrance who is of opinion these shells, and all others underground are lodged there by subterranean currents. In the 'Natural History of Lancashire' by Dr. Leigh, the author boldly affirms all fossils to be disports of nature, or *lusus naturæ.*] I examined carefully this stratum where I found a great many kinds of shells,† but none which had withstood time's devouring teeth, so as to bear the handling, excepting the common wilk, some of which were very perfect.

"Amongst the variety of things I took notice of in this *stratum*, was a piece of coal which I picked out from amongst the shells. This must have been there as long as they, and been brought from some other county, as nothing of the kind is to be found here, but

* Dr. Thomas Brown of this city presented the Royal Society with a petrified bone found at Winterton in the year 1666.

† Common cockle, black mussel, oyster, *pectunculus*, &c.

what is brought from distant parts. This seems to prove that the use of coals has been known to the ancient Britons, and that they brought them hither from the more northern parts when the sea covered the greatest part of Norfolk, though in all probability, this must have been thousands of years ago. These shells lie fourteen yards above the surface of the river, and nearly six beneath the top of the hill, and I believe thirty-four yards above the surface of the sea at Yarmouth. I have one thing still to relate to you which is really wonderful and very much beyond my utmost endeavours to find out a sufficient reason for, it is that in these very marl pits, and I dare be bold to say six or seven yards lower than the above-mentioned stratum of hills, are found an unaccountable quantity of stags' horns, lying in all directions, several I took out with my own hands, and the workmen who are employed here tell me they scarce work a day but they find more or less of them. But with my utmost diligence I have not been able to find one whole and entire, nor do the workmen say they ever did, which I take to be very strange. These horns have been very large ones, some of the spines measuring twelve inches and upwards in length. The horns themselves, many of them, are better than two-and-a-half inches in diameter, and several of them above twelve inches from spine to spine."

On the faith of what a workman told him he makes the following remarkable statement, but which I fear, modern geologists will doubt the truth of: "The entire skeleton of a man was found in the same bed or stratum, with the above-mentioned horns, as one of the workmen assured me he said, he took pains to lay it all together upon the grass as regularly as he was able, but his curiosity being satisfied, he left it to be ground to pieces by the carts and wagons that came hither for the marl. So careless were these poor ignorant people of so valuable a specimen of the human race! What instructive inferences might have been drawn from such a skeleton, with respect to the magnitude of men in the early ages of the world! I own I cannot but regret the loss of it.

"*Helmet-stones* and *belemnites* are here found in abundance at all depths and in every different *stratum*, which I think shows that the fish that produced these fossils have been all over the county, as the like are to be found in every place wherever the earth is broken up or a pit digged.

"About a mile s. of a little country town called Kesick [Keswick], and near two furlongs from Hartford [Harford] Bridge, is a pit in which the country people dig a particular sort of clay—to lay upon the sandy lands. Amongst this clay are a great many knots, lumps, or nodules of a blue sort of earth, not widely differing from that which is found in Harwich cliff: these when digged up are soft, but when they have been for some time exposed to the open air, they become almost as hard as flint. In and upon these lumps are the impressions of the *Cornu Ammonis* or snake stones in a beautiful manner, from an inch to five inches in diameter, and several I saw with part of the shells upon them of a yellowish white.

"Many other shells are to be found in these lumps, as the *pectunculus*, helmet stones, belemnites, common cockle, *turbos*, &c., but they are most of them very small.

"But still more curious than all are certain lumps of petrified, crystallized matter of a very odd form, such as I have never seen or read of. They appear to have been originally lumps of blue clay, cracked by some subterranean heat or other unknown cause, into which the water had insinuated, and the salts contained in them have crystallized in the cracks. When these lumps are taken up and become dry, the clay part falls from the external cells, and then they may be thought grossly to represent an Honeycomb. At first I took them to be bones from withinside the skull of some great fish or other sea animal, but some I have seen lately, and of which I shall send you a specimen, have convinced me I am mistaken; indeed, since I wrote the above, I have compared this fossil with the description *Dr. Woodward* gives of the *Ludus Helmontii*, and I think it agrees somewhat therewith."

The origin of fossil shells, &c., seems to have puzzled the philosophers of that period, and various theories were started to account for their presence in the rocks. "The ever-memorable Dr. Hook" says that earthquakes seem to be the chief efficients which have transported these petrified bodies, shells, wood, &c., and left them in such parts of the earth as are not otherwise likely to have been the places wherein such substances should be produced. With this opinion Mr. Arderon is not disposed to agree: the regularity of the strata of shells, he thinks, confutes this theory.

"Dr. Woodward's hypothesis, or manner of bringing these shells and all other forms into the places where we now find them, by a

total dissolution of matter, is indeed very pretty; but so many difficulties arise (however plain it may be to him). I believe few now-a-days are of his opinion."

"Above all, I think Mr. Petit's liable to the fewest objections, viz., by the variation of the parallelism of the earth's axis, which, being allowed, must certainly alter the centre of gravity: if so, all the fluid parts will conform thereto, and then it will follow that one part will be covered and overflowed by the sea that was dry before, and another be discovered and laid dry that was before overwhelmed."

Mr. Arderon sends a description of some large subterranean caverns in the chalk hills near *Norwich*, near *Mousehold Heath*, which had been formed in a long series of time by the digging out of the chalk for the making of lime. "There's but one entrance into it, whose breadth is about two yards, and its height nearly the same; however, the height gradually rises, till at last it measures in some places from twelve to fourteen yards. Notwithstanding the entrance is so small, the whole area within is of such large extent, that twenty thousand men might with great ease be placed therein. In the very lowest parts of these vaults, I have picked up several kinds of fossils figured by marine bodies, such as echini, pectunculi, common or fluted cockle, belemnitæ, &c., and by diligent search other sorts might be found. Sounds made beneath these arched roofs are strongly reflected from side to side, so that the least whisper may be heard a considerable distance: the beat of a pocket watch was heard distinctly full twenty yards from where it was placed." The temperature of these vaults are very equable, being about 52° by his Hawksbee thermometer. From a note to this paper, it appears that a terrible thunderstorm, on June 12th, 1748, shook the earth to such a degree as to throw down these chalk vaults.

In the year 1746, the crops in Norfolk and Suffolk were seriously damaged by "grubs or maggots, full as thick as a man's little finger." Mr. H. Baker applies to Arderon for information "respecting the nature of this pest, which he imagines might be the aureliae or chrysalides of some species of Beetle." Mr. Arderon's reply is laid before the Royal Society, prefaced by an extract from a letter published in the 'London Evening Post' of Oct. 29th. (Arderon's paper was read Nov. 5th.) This letter states that "the

first news we heard of them was about two years ago, by a gentleman who lives near Norwich, and they were supposed to be newcomers. This summer they have been much in High Suffolk—to the farmers' and graziers' great loss; and we now hear they are likewise in some parts of Essex; they are often discovered by hogs, who, as I am informed, are greedy of them at first, but having filled their bellies full, never care for them after." Of these grubs Mr. Arderon gives the following information:—"They are a species of insect but too common about Norwich, and to my own knowledge, have been more or less numerous in this county for twenty years past. They are the *erucæ* of the *scarabeus arboreus, vulgaris major* of Mr. Ray, that is, the tree or blind beetle, vulgarly, in Norfolk, called the dor. In different parts of England they are called the brown tree beetle, the blind beetle, the cockchafer, chafer (this is evidently only the Dutch and German word for beetle—kaefer), the jack horner, the jeffry cock, the May-bug, and the dor. In Cambridgeshire they are called Midsummer dors. Halliwell, in his specimens of provincial dialects, gives the following local names used in the Isle of Wight for this beetle: Straddlebob, and Dumbledore."

Arderon's description of this beetle shews that he was not only an acute observer, but also able to describe clearly and accurately. "This insect has two pairs of wings, one filmy and the other scaly. The first pair fold together under the latter, and remain quite hid unless when spread out for flight. The *elytra* or case wings are of a reddish light brown colour, and seemed sprinkled with a white powder that may be wiped off. The legs and pointed tail are whitish, the rest of the body brown, except at each joint on each side of the belly, where there is an indented line of white. The circles round the eyes are yellowish, and so are the *antennæ*, which are short, and terminated by lamellated tufts, capable of being opened more or less."

Mr. Arderon then proceeds to give several instances of the destructiveness of the larvæ of this beetle in the year 1746.

"On a farm at Heathel, near seven miles s.w. of Norwich, of £80 per annum, belonging to the *St. Helen's* hospital in this city, in the occupation of Mr. James Elden, these insects were so numerous last year that the farmer and his servants affirm they gathered 80 bushels of them, the erucæ of which had so spoiled the produce of his farm that the Court of this city, in compassion of the poor

man's misfortunes, allowed him £25, the order for which I send you a copy of, dated December 5th, 1746." In a subsequent letter to Mr. Baker, Arderon writes that "Mr. Elden solemnly declared before the committee of St. Helen's hospital, that the damage done to him that year amounted to £100 and upwards." He also adds, that "some ingenious persons account for the large increase of these insects from the decrease of rooks in this county, owing to most of the ancient rookeries having been destroyed by the large fall of timber trees made of late years, which has obliged the rooks to remove into other parts of the kingdom."

In order to learn the habits of fish, Mr. Arderon establishes a miniature aquarium. His first attempt was with a glass jar, that held near a quart; into this he placed a small dace about one inch in length (this was in the beginning of September, 1744), which he kept till the end of May following, in which time it grew full half-an-inch in length, but very little in breadth. "I believe I might have kept this fish for years, but a multitude of business one day prevented me from giving it clean water in due time, which unfortunately put a period to the life of my little companion.

"At first when I catched this silver-coloured fish, it would not suffer me to come nigh the glass which included it, without the utmost confusion and surprise; but at last, by gentle usage and a little art, it grew so tame that if I came but in sight, it would sure to be of the same side of the glass I was on, and be gazing at me until I was weary of observing it.

"I at the same time put a ruff into a larger glass. The fish appeared mightily reserved and would not eat anything, but after a time, hunger impelled it to take the food offered it, and at last it would take small worms out of my hand; and at last it would come to my hand whenever I put my hand into the glass, and suffer me to handle it. But to ease me of my care when I had made my observations, I thought necessary, and in pity to its confinement, when I had kept it about seven or eight months, I gave it its liberty.

"About Christmas last, I put two ruffs into a jar of water, where they lived together until April, when, at the desire of a friend, I gave one of them away. After the separation, the fish that remained with me was so affected that for three weeks it would eat nothing I could give it, and therefore, fearing it would pine to

death, I sent it to the gentleman on whom I had bestowed its companion; and what is very extraordinary—upon being put together again, it eat immediately, recovered its former briskness, and both of them are still alive.

"On the 12th of June, 1746, when I was viewing the floodgates belonging to the waterworks in Norwich, I beheld a great number of eels sliding up them and the posts adjacent, notwithstanding they all stood perpendicular to the horizon, and five or six feet above the surface of the pool below the waterworks. They ascended these posts and gates until they came into the dam above, and what makes the matter more strange, they slid up with the utmost facility and readiness, though many of the boards and posts were quite dry, and as smooth as a common plane had left them. I observed that at first they thrust their heads and about half their bodies out of the water, and held them up against the work for some time—I imagine until they found the glutinous matter which is constantly about their bodies become sufficiently thick or viscid by being exposed to the air to sustain their weight—then they would begin to ascend directly upwards with as much ease, seemingly, as if they had been sliding along level ground, and thus they continued to do until they had got into the dam above."

Mr. Arderon did not confine his observations to the habits of ruff and dace, but experimented upon perches, banstickles, miller's thumbs, minnows, roach, &c., but he gave the preference to the ruff as being more easily tamed. The banstickle or stickleback he found to be the most pugnacious and unsociable, that it would not suffer any other fish to live in the jar with it, "and so audacious as to attack whatever I put in, though ten times its own size."

He continues his observations on fish for nearly four years. In March, 1748, Mr. Baker read a letter from Arderon at a meeting of the R.S., in which he says, "I have, for the last three years past, been continually trying experiments on several kinds of fish, which I have kept in glass jars for that purpose, and at the hours of feeding them, as well as at other times, have, by different noises, such as whistling, halloing, the sounds of several musical instruments, and every other means I could contrive, endeavoured to discover their sense of hearing—if they were indeed endowed with that sense—but could never perceive that they were affected by any of these noises.

"But whether fishes do or do not hear, it is certain their senses of feeling and seeing are exquisitely quick; and I believe, by the extreme sensibility of these two one may explain most of the accounts that have been brought by writers as proofs of their hearing.

"I have often struck with my thumb nail against the edge of the glass jar in which I kept my two ruffs, a stroke not harder than the beat of a pulse, which would cause them, in a moment, to dart from the bottom of the jar to the top, though I am sure they did not see me. But if I made the same motion without hitting the glass, or if I made an hundred times louder noise than the striking of my nail against the glass at a very small distance from it, I could not perceive they were the least affected thereby, which, if duly considered, may amount to a proof of the deafness or want of hearing in this kind of fish at least. Indeed, I have often been convinced by experiment that their feeling is exceedingly acute, perhaps more so than in other animals, whence I have been led to imagine that their fins may be the organs more immediately sensible of the slightest motions in the medium wherein they dwell."

Mr. Arderon remarks in a note, that "his experiments have been made with fresh-water fishes, but tis not to be denied that fishes of the cetaceous kind may probably hear, as well as some other kinds produced in the sea, that have parts in common with land animals." The question as to the power of hearing in fishes seems to have been a favourite subject with the Fellows of the Royal Society, as several members about this time contribute articles on the subject, all however, agreeing, *that fishes of the cetaceous kind* are capable of hearing. In December 1744, he sends to the Royal Society an account of an operation performed by Mr. J. Harmer (a surgeon), of Norwich, for calculus, when to the surprise of the operator and his assistants, a "spire" of a weaver's shuttle was extracted, instead of the supposed calculus. This "spire" was four inches in length. The patient, a boy of seventeen, perfectly recovered. He invents a "Weaver's alarm vulgo Larum," a very simple affair, but it was thought worthy a place in the 'Transactions' of the Royal Society. In the same year he sends a description of the Bridewell in this city, referring to it as an admirable specimen of an art now lost. "I mean the art of cutting or rather breaking flint stones into uniform figures of various sizes, the best specimens of this lost art are to be found in this city."

Mr. Baker asks him to send a description of Caistor camp to the Royal Society. This communication with a plan appears in their 'Transactions.' *

Mr. Baker reads to the Royal Society an account of John Coan, a dwarf, born at Twitshall (Tivetshall), in Norfolk, in 1728. His weight, with his clothes on, was 34lbs.; his height, with his hat and wig on, 38 inches.

Between the years 1743 and 1750 he sends twenty papers to the Royal Society, a number exceeded by only one other Fellow, a Mr. W. Watson, an apothecary, who contributed twenty-two. After 1750 he does not appear to have done much, probably business occupied more of his time. The following is a list of his papers, from which I have given no extracts:—

1. "A description of a water wheel for mills, invented by Mr. Philip Williams."

2. "An account of a Bristle that was lodged in a gentleman's foot."

3. "On the white matter that floats about the air in summer."

4. "On the formation of Pebbles."

5. "A representation of a Halo or Mock-sun, observed July 11th, 1749."

6. "On giving magnetism and polarity to Brass."

7. "Observations on the late severe and cold weather."

8. "Account of the agitation of the waters observed at Norwich November 1st, 1755."

9. "The quantity of rain fallen in a foot square, at Norwich, 1750 to 1763." The quantity of rain was estimated in wine pints. In the table for 1750 the rainfall in Norwich was 100·7 pints = 20·18 inches. The Rev. Marsham describes this year as being very dry (see "Indications of Spring," in this volume, p. 34).

The MSS. in my possession consist of—1st, very copious extracts from various scientific works of the day; 2nd, a MS. volume of poetry copied from various magazines, &c.; 4th, an original tale, entitled,

"THE LIFE
and Surprising Adventures
OF JACK TOMSON,

setting forth the various Vicissitudes of Fortune, and Hardships he underwent during the fourteen years he remained upon an

* A copy of this paper is amongst the MSS in my possession.

uninhabited island. Likewise the manner how he procured his food and clothing whilst he continued there, with many other things too tedious to mention in a title-page, writen by Himself."

"To the Reader.

"Kind Reader, I know its no uncommon thing (now-a-days) when so many Romances are published, to be anxious to know whether a Book is Built upon real Facts or fictions. I wish it was in my power to oblige the. Yet in this I must be excused. But as I came by this Book by Chance, the manner how, take as follows:— One day I was walking upon the Key at Bristol, I see a Bundel of papers lye before me wch I took up & put into my pocket, to examine at my leisure. I found the whole contained a minute Relation of several happy deliverences at sea, all of wch to me appeared possible.

"The whole is carried on under feigned Names, wth this view, I presume. If the Author should be unhandsomly treated By the Snarlers and Groulers of the Age, (I mean the Criticks), he may be able to escape their Rancour & Malice in Disguise, & to laugh at their Ignorance in the very presence of those that are Guilty of it.

"I shall say no more, but where a person is not able to mend a thing, it is most prudent to be silent."

This tale appears to be a very weak imitation of Robinson Crusoe, and clearly shows that romance writing was not Arderon's *forte*. These adventures are supposed to have taken place in 1752.

5th. "An Essay on the Various uses of Sand in the Mechanick Arts. Writ in Oct. 1747. W.A."

6. "Miscelaneous Observations & Remarks upon various Arts & Trades, pointing out several Errors in the English National Œconomy. Likewise several amendments that may be made therein."

"Commend me or come and mend me."

This essay treats on the following subjects:—

Education and the choice of Professions and Trades.

Employment of Paupers and Criminals.

Education and employment of Women.

Division of labour.

Utilising waste Lands.

Painting of Timber.

Free Roads.
Employment of Soldiers in times of Peace.
Capital Punishment.
Intra-mural Interments.
Cruelty to Animals.
Uses of Waste Materials.
Bankruptcy.
Training of Soldiers.

The essay occupies over forty quarto pages of M.S.., and is much too long to give entire. I will therefore quote such parts of it as will show that the writer was no ordinary man, and that his taste for natural history had not prevented him from thinking upon what are usually deemed more important matters.

On the choice of a Profession or Trade.

"The next mistake I shall mention in training up a youth, is the irrational method followed by most parents, in chosing the trade or employment designed for their children; here they are guided chiefly by pride or avarice or some other particular whim as bad, without in the least considering their genius or abilities, so it often happens, a Clergyman, a Lawyer, or Physician, would, if duly examined at their first setting out, been found better fitted to handle the Plane or Hatchet. And he who now is busied in tilling the ground, might have been one of the First-Rate in the Republick of Letters."

"To remedy this error," he would have the child examined by some judicious person, to test the capabilities and aptitudes of the child. "For which purpose I would have in every Parish some ingenious skilful person or other appointed, who should have authority given him to inspect into the Genius & abilities of all Children, before they are put out to Trades or Employment, which they are designed to follow for their Lives, and if this Person's opinion was not imposed as a Law, yet every wise Man would pay great respect to it, when he was satisfied the future Welfare of his child depended thereon."

In a foot-note to this paragraph Arderon remarks: "I would have this done by the Schoolmaster of the Parish, but indeed as they are now commonly qualified they are very unfit for this Office,

however, as it would certainly be of an universal service, I would have them regularly brought up and pass a strict Examination, before they should be permitted to keep a public school. And this to be done at the National Expense. As the custom now prevails, its left to mere chance whether a man of Learning and Sense supply this important post, or an illiterate Idiot." The funds to meet this expense were to be raised by laying Taxes on every species of Luxury and Vice, such as Laced Hats, Swords, embroidered Cloths, fantastical dress in women, gaming of all kinds, Stage Plays, Shows of every denomination, also upon non-attendance of Divine Service, Drunkenness, Wh——g, &c., &c.

The cultivation of waste lands would also yield a large amount for the purpose, and in a foot-note he remarks that, "Norfolk is a county which boasts much of its being highly improved, yet I believe $\frac{1}{6}$ of it is waste ground, and I am satisfied there's fifty square miles at least lies uncultivated within twelve miles of Norwich, which does not produce two shillings per annum per acre to the Inhabitants."

On the education of Women.

"If I might advise I would have women educated not only in litterature but in every other Art or Trade their station of life and abilities suited, thus would be a great assistance to the nation in time of war, when men are scarce, this is evident from the great service they have been of in the Weaving Trade at Norwich in the present war with France."

Capital Punishment.

The writer was opposed to the infliction of capital punishment, which he thinks should never be inflicted but for murder, upon any one whatever. "Malefactors condemned for Theft, Treason, counterfeiting of our Coin, Smuggling, &c., should be employed in forced labour for a term of years or for life."

Intra-mural Interment.

"Another pernicious Custom prevails amongst us, that is, burying in Churchyards, and what is much worse in the Churches themselves, this even in the Country is very wrong, but in cities and

other populous places quite intolerable. When the Body putrifys it fills the Stagnant Air in those places with corrupt particles of matter, which from the human Body nothing is more offensive & in Epidemical Distempers nothing worse." To remedy the evils arising from intra-mural interments, "I would have a Place appointed for every parish at a convenient Distance, large enough and well inclosed, which should be made use of for this purpose & nothing else." [Norwich adopts this idea about a century after the above was written.]

Cruelty to Animals.

"I am satisfied there's none of our actions in this life wants reforming more than the cruel usage we daily see inflicted towards Brutes. One kind of Cruelty is practised daily among us here in Norfolk, which I am apt to think the wildest Savages in America would tremble at, I mean the continual bleeding of the Calves designed for slaughter for the use of man, to describe the method would strike the hardest Heart with terror. I would have every Person who wantonly kills or torments any Animal have adequate Punishment inflicted upon him according to the barbarity of the Crime."

On the Utilization of Waste Products.

This part of the essay is of much interest, but time and space will not allow me to do more than glance at it. I must, however, call your attention to one or two portions of it.

"From the refuse or pickings of stuffs is produced a very good warm Cloth called 'Fear nothing.' [I have not been able to ascertain what kind of cloth this was.] From Tailor's Shreds (a Late Invention) is produced a Soft downy Substance for Seafaring Men's Beds." A foot-note states that, "There is an Engine for this use lately erected at Helsdon within two miles of Norwich." After giving many other instances in which so-called waste has been made a source of profit, he observes, that "there is the greatest probability of there being numberless Arcanums yet lying dormant in the unknown properties of Matter, which if carefully examined into may one time or other richly pay us for all our trouble of searching them out."

Amongst his desiderata is one which has been accomplished, viz.—"The Art of Sailing without Oars against Wind and Tide."

BANKRUPTCY.

I fear Mr. Arderon had been victimised in some way, as he proposes a very harsh punishment for Bankrupts, who, he said, "are for the most part wicked men, and who abuse their best Friends the worst of all. Now to cure this Evil, I would have every Bankrupt to wear a Badge upon his outward Garments, denoting how much in the pound he has paid, until he has paid the whole of his Debts, and on default of this, to be transported for 7, 14 years, or for Life, according to the pleasure of the Majority of his Creditors."

This essay was written in 1756.

The copies of his letters in his letter book are fragmentary, and generally without date or the name of the person to whom he is writing, a circumstance now perhaps of little moment. The following was written to a friend at Cambridge :—

"DR. SR.

Yours of Monday last came to my Hand this Morning, and to show you how willing I am to repair the Lapsas [*sic*] I made in my last, I would not let the day pass before I returned you Answer.

"I am glad anything I can do will add to your pleasure or amusement, that alone will allways induce me to endeavour for it.

"The Pebles [*sic*] you gather me about Cambridge may be valuabler than you imagine, for all the pains I have taken I find it very difficult to guess by the Outside what the Insides will be.

"I own those which are coarse little can be expected from them by polishing, yet I should like to have a few, be what they will, as I have a design to make a Collection of all the Different kinds I can procure.

"Your Uncle from Lyn is in Town, but I have not seen him, so can give you no account of the 'Asstroits' as yet.

"I heard about a fortnight ago, several Young Locusts were seen about Barrow Apton, and one I found myself, on coming from Thorp, but this exceeding cold rainy Weather I presume, will put an end to their progress.

"I also read the letter from Oporto, and its possible the Magnitude of the Hail may be somewhat increased by ye Relator, but have great reason to believe Hail in some places, have fallen of a very large Size, & from what I have seen myself, I think it was in 1715, Whilst I was a Scholeboy in Yorkshire, at which time I see several an Inch in Diametor of various forms, Transparent and Solid as Common Ice, and had I then been curious enough to have sought diligentlier, its possible much larger might have been found.

"I think its plain these large kind of Hails are formed and freze in the upper Regions of the Air, where it must be cold beyond the severest frosts we ever have in our Climates And further, I think it self-evident they are froze during the time of their fall, for it would be difficult to account how such heavy Bodies should continue any time suspended in the Air, unless they were high enough to be out of the Earths Attraction, which I believe few will imagine.

"The Caterpillars you mention are pretty Common almost in all Gardens, but with all my industry I could never bring them into the fly state, though I have pretty often attempted it; all I know of them is--they eat of several different kinds of leaves, and at last retire into the Earth in their Chrisalis state.

"You'l have, I find, a Grand Shew at the Instalation of your new Chanciler; I should like to see it.

"Yesterday was Guile, & this morning I see your grandfather, who is well; the Rest, I doubt not, will be communicated to you by other hands, which have more leisure."

[The allusion to the new Chancellor at Cambridge, and the Norwich "Guile," fixes the date of this letter. The new Chancellor was Thomas Hollis Pelham, Duke of Newcastle, elected 1748, installed July 1, 1749. Norwich Guile was in the latter part of June.]

All the copies of his letters want the signature, but the handwriting is sufficiently characteristic to enable us to identify them as being those of Arderon's.

Although the letters of which copies exist are but few in number they afford sufficient evidence that his opinion was constantly sought for, not always on matters of natural history, but sometimes on the merits of a piece of poetry, as the following letter from one of his correspondents proves :—

"WYMONDHAM, DEC. Y^E 2ND.

"Sir,

My Thanks wait upon you for your Care in procuring the money which I received with your Letter: Miss Randall and your Hum. Servant was obliged by your generous offer, but I assure you it was for neither of us; Therefore desire you to acquaint us with the price the first Opportunity.

"I am glad Mr. Desagiler's Lectures afford you so much pleasure; You were very kind to wish me to share in it, but it requires a genius superior to mine to understand Philosophical Discourses.

"Certainly your candour (? kindness) bribed your Judgment when you thought me capable of receiving satisfaction therefrom: you are very happy in enjoying such exquisite Delight every Day, and I must Congratulate you upon it. But, Mr. Arderon, could you have the Happiness of conversing with ye incomparable Miss Turner, you'd be convinced that Justness of Thought and elegant expressions are accomplishments not confined alone to Man! There's such delicacy in all her sentiments, something so very engaging in her Behaviour, as necessitates one to admire. Mr. Talbot no longer calls me a Mass of Indifference, but tells me the pleasure I take in visiting that young Lady is not consistent with insensibility.

"The enclosed was recommended to her by your Bishop, and a Lady of first Rank desired I should write her a Copy of it. After the Approbation of such judges, I thought I might venture to send it to you, and as I always pay a deference to your Opinion, I hope you'll not deny that Favour to

Sir,

Your obliget Friend,

W. ?

My Service to Mrs. Arderon."

On the back of this letter Mr. Arderon has written the following opinion of this piece of poetry praised by a "Bishop and a Lady of first Rank."

"In the 7th Stanza & the 6th line there's a foot too much. In the 6th line of the 8th stanza there's an s too much in forbids, which is never used in the plural number of verbs, with some other inaccuracies which are not worth mentioning; however, I

own its a good piece take it in general, and shows a good poetick genius, but perhaps no grammarian."

"And as you have given me a piece of poetry on Marriage, I send you a piece on Love—the prelude to that honourable Institution."

Whether this "piece" was Arderon's own composition, I have no means of knowing. The following fragment occurs amongst his MSS., which may possibly be the offspring of his mind:—

"FAREWELL TO NORWICH.

Made on the Road to Bury.

"Farewell at length, the proud insulting spot,
Where gentle ease and manners are forgot;
Where lawless Pride, with supercilious state,
Assumes importance and is oddly great.
Farewell, the busy round so much admired,
Of country routes where . . . . . ."

The earliest traces of his microscopical labours are a series of "Observations on Animalculas." "These observations were chiefly made with small Glass Spheres." The forms he studied, or rather, attempted to study, were those found in infusions, and as these require the highest powers of our best modern instruments, his researches were of but little value. A few years later on, when he became possessed of one of Cuff's best microscopes, he was able to do some good microscopic work.

Mr. Baker gives a very elaborate description of "an insect with net-like arms, and which might perhaps have remained long unknown, had it not been discovered accidentally by the same ingenious searcher into nature, to whom the reader is obliged for many curious Articles in this Volume." * This insect was found in the Cascades, at the Seat of Benjamin Nuthal, Esq., at Framingham in Norfolk, on the 25th of May, 1746. Amongst the MSS. in my possession is the draft of a second letter to Mr. Baker, written three years afterwards. This letter enabled Mr. Baker to complete his description. It is as follows:—

"On the 10th of July, 1746, I described, and sent you a drawing of, an aquatick Insect which I discovered on the 25th of May foregoing, in a Cascade of Ben. Nuthal, Esq., at Framingham, the singularity of which induced me to endeavour several

* *Employment for the Microscope*, p. 337.

times to look for some more of them, but never having an Oportunity to go thither at or near the same time of the Year until now (May 21, 1749), I never could find any, this gave me reason to think they changed into some other shape, or altered the place of their abode in the different seasons of the year, the former of which I now plainly see is the case.

"The Regularity and Strangeness of the Shape of these Insects, with the various Forms they can and do at pleasure put on, would render any description I own incredible to any persons excepting to those who have taken pains to survey and admire the wonderful contrivances, beauty, and symmetry, there is to be observed in every other species of the insect tribe.

"In my above mentioned letter, if I mistake not, I gave you the drawings of two different Forms this insect changes into, but I now see it can at pleasure put on a third such as you see pictured at Fig. & it is further to be noted of these different shapes that it remains often but a very small time, at others longer, just as I presume the necessity of affairs require.

"The first form I had the pleasure to see this Insect, was when it spread its Nets to catch its prey, (see Baker's Microscope made Easy, Plate xiv, f. viii, to which I shall refer for the delineation of this form). The second when it puts forth its little spears (fig ix); the third which I have since observed, is represented at (fig. x) in which it mostly lies when it is watching for a capture, as I have more than once observed.

"On the 21 of this instant, May, happening to be near the above mentioned Cascades, & remembering it was nigh the time I had formerly found these insects, it cost me but very little trouble to light upon them again, and even in the very place where I had found them before. A great many of them I brought home in a phial, but in two days the greatest part of them were dead, and the others had spun themselves Cases in the manner you will find them pictured at (fig. xi, xii). It is somewhat remarkable, altho' I had changed the water I kept the insects in 3 or 4 times in 48 hours, yet it stunk every time to such a degree as is scarcely credible, especially when I tell you the whole quantity of insects bore no greater proportion to the including water than 1 to 1,550,000. How exquisitely minute must the particles of this effluvia be."

Mr. Baker says that Mr. Arderon was also the first to find the very beautiful zoophyte which Mr. Trembly afterwards called the *Polype à panache.* "I was first informed of this creature by my industrious friend Mr. William Arderon towards the end of the year 1743, as his letters show, and in the year 1744 it was taken notice of by Mr. Trembly, who gave it in his *Memoires.* The name of the *Polype a Panache* or plumed Polype. My Friend who discovered it called it the Bell flower Animal."*

I have an original sketch of this animal made by Mr. Arderon; he says he found it in a ditch near Spring Gardens in Norwich. [The locality of these Gardens had long puzzled me; my friend Mr. Knights, however, informed me that "The Spring Gardens, in Norwich," were by the river-side at the bottom of Rose Lane, occupying the site upon which now stands oilcake mills, timber yards, rows of houses, and boat yards.†]

The insect described below was one of the sociable mites, probably *Tetranychus salicis* or willow mite.

Insects on Willows.

"On the 12th of August (1749), in the evening I happened to go out into my garden, in the passage to which stand some willow trees. Having a candle in my hand, I observed the barks of these Willows appeared as if they had been covered with a thin coat of Ice, but coming nearer I found it was with something not much unlike a spider's web, only this reflected the light prodigiously. The day following I went to examine it again, and I saw myriads of little insects running upon the glistening webs which surrounded every part and branch of these trees, they were in continual motion, running backwards and forwards, they were shaped exactly like a common mite, but their hairs I think, were longer, their coats were of an orange colour, but curiously varigated with black which gave them a great resemblance to tortoiseshell. They little exceeded a common mite in magnitude. Under these webs the whole back of the trees and every branch of them were covered with

* This animal is the *Alcyonella stagnorum* of recent observers. It used to be found in the swan pond at St. Helen's Hospital.

† There was also a Spring Gardens on Mousehold.

round ova of a blood red colour $\frac{4}{1000}$ of an inch in diameter, and I found about 200 of these laid in an inch in length, consequently 40,000 in one superficial inch, when this is considered of, it will appear no wonder to tell you the whole bark of the tree appeared of a greenish red. In the night no mites were to be seen, but all still without motion, but in the day time the whole appeared to be one continued scene of action. I examined some of the web, which to the naked eye looked to be one entire coat, but when highly magnified very much resembled strips of parchment or paper, and when the largest strip I could find was magnified seventy-two times, it was $\frac{1}{3}$ of an inch in breadth, which consequently must be $\frac{1}{360}$ part of an inch in its natural bigness. What is very remarkable, these trees in a very short time had their leaves curled up, withered, and appeared as if they had been struck with lightning, and it is probable this may be the case with many which are thought to be so, and may arise from the obstruction which the glutinous matter proceeding from these insects, may produce to their perspirations.

"Most kinds of spiders and Caterpillars are allowed to spin webs, but that mites can be found to do so, is, I imagine, a curiosity."

In the year 1749, Mr. Arderon discovered in a ditch in the Spring Gardens, Norwich, "The Hair like insect," thus noticed by Mr. H. Baker in his 'Microscope made Easy.' "The wonderful animalcule was I believe first taken notice of by my friend, Mr. William Arderon, of the City of Norwich, who kindly sent me an account thereof, together with many thousands of the creatures themselves, which came to me alive in a vessel of the same water they were found in, and lived with me several weeks, whereby I have frequent opportunities of being convinced how carefully he had observed them. . . . . This little animal is extremely slender, and not uncommonly one hundred and fifty times longer than broad. Its progressive motion differs from all animals besides hitherto described, for notwithstanding the body is composed of many rings and joints, it seems unable to bend at all, or move directly forward, but when inclinable to change its quarters it can move from right to left, and from left to right, and proceed at the same time backwards or forwards obliquely. . . . . When viewed singly they are exceedingly transparent, and of a lovely green,

when numbers are brought together they become opake and lose their green colour in proportion as the quantity increases till at last they appear entirely black." Mr. Arderon made some coloured drawings of this organism, and which I found amongst the before-mentioned MSS., these with the above description enables us easily to identify this supposed animalcule as belonging to a genus of fresh water Algæ, the Oscillatoria of Agardh, and is doubtless *O. limosa* or *O. nigra.* Mixed with the above he detected a minute form resembling a grain of some sort, from this resemblance he called it "the Oat Animal." From Mr. Baker's description I have no doubt but that this was some species of Diatom probably *Navicula amphisbaena* or *N. sphærophora.*

"To Mr. T. Harmer.

"Sir,

The Rose you sent me is very curious; I'm much obliged to you for it indeed. I have bestowed very little time in the study of Botany, consequently shall not give you so satisfactory an answer as I would wish. Had the Rose tree produced in general such flowers as these, it would have demonstrated to me an easy solution to this part of your letter: for then I should have told you, the seed which had produced this tree had been impregnated with the farina Fecundans of some double-flowering species of Vegetable, of which there are various kinds of such, as Cowslips, Primroses, Auriculas, Anemones, &c.; and the interposition of whose Farina may cause many kinds of plants which are nigh them produce a kind of mule in the Vegetable kingdom. Other monstrous productions are produced from too great an exhuberancy or deficiency of some particular kind of matter in their component parts; others from sudden strokes of Lightning, and some from the gnawing of insects—which diverts or prevents the plastick power of nature from performing its designed Office, but which of these have produced this odd phenomenon might best have been discovered whilst the flower was fresh and in its perfection."

The peculiarity of this rose was "one flower growing out of the top of another."

The next and last letter is without date or address—it is evidently addressed to some medical friend.

"Sir,

Your obliging letter came safe to hand on the 12th of this Instant: its contents were very acceptable, and I am glad to see a friendship cultivated for so short a space of time still remains without diminution. I think it demonstrates that should it be ever our fortune to live nigh each other, it would be very agreable to us both—for my part, I should take it as a very great addition to my happiness. I think your Clergy seems to have very little dependence on God Almighty's providence, and to have done more harm by their bad example, than they can retrieve, perhaps, as long as they live, by their preaching. I'm much obliged to you for your description of the China works at Chelsea; they would be a most delightful sight to me could I see them.

"Without any compliment, I sincerely believe an ingenious man with good conduct—such as yourself—might do very well in Norwich, either as a physician or surgeon, or both; at present we have only three of any note, one of which is mightily afflicted with gout, viz.—

M. O. a physician
M. H. a surgeon
W. W. a physician

"The next are nothing more than common Apothecaries, and only make work for people of better judgment. I know it would be a work of some time ere you would be known, but then I am satisfied it would answer your desire. My interest and all the friends I can make you may depend on."

In a letter to one of his masters, he says, "our Trade is very brisk, & I have rose our Flour twice since I see you, and it still goes off. Hous^d at 28/. Wheat Rises, & I gave 16/9 pr comb yesterday for what I bought, and have upwards of a 1000 combs by us."

In January, 1746–47, a Natural History Society was formed in Norwich, to which Mr. Arderon contributed the opening address, in which he alludes to the service rendered by the microscope to natural history. He then proceeds to point out the resemblance between the animal and vegetable kingdoms.

This Society probably existed for some years, as I have in my possession a MS. volume of his labours on various subjects, such as the Tides, Rainbows, Sound, Fire (or Motion), Tails of Comets, &c.

He has also left the MSS. of two sermons, one of them on "Kindness to Animals," taking the following sentence for his text: "And the dogs came and licked his sores."

I have endeavoured, from the *disjecta membra* in my possession, and the papers in 'Philosophical Transactions,' to give you some idea of a man who, in spite of his humble position, and the disadvantages of a very moderate education, managed to obtain the esteem, not only of the wealthy and learned, but also of his employers proving that his taste for scientific pursuits did not prevent his being a good man of business.

V.

NOTES ON NORFOLK MAMMALIA.

Communicated by FRANK NORGATE.

Read February, 1878.

GREAT BAT *(Vespertilio noctula)*. On the 27th of October, 1874, I examined an old nesting hole of *Picus viridis*, about thirty feet from the ground, in the top of a dead Lombardy poplar stump, in Sparham. On cutting the nest open I found a ♀ Noctule, hanging by its hind feet It was hairy armed to the thumb, and the fur was bright chestnut. In the parish of Dilham, on the 10th of May, 1875, I took three Noctules, two ♀s, and one ♂, from an old woodpecker's hole, about thirty feet from the ground, in a Scotch fir. The hole had probably been bored by *Picus major*, but I am not certain, as the edges were much decayed and chipped. There were five (if not more) bats in this hole, two which escaped appeared to be Noctules. My attention had been attracted by the squeaking of the bats.

In Hockering Wood, on the 8th of June, 1877, I saw four Noctules in an old Nuthatch's nest, which was originally bored and used by *Picus major*. The hole was about twenty feet from the ground, in the trunk of a small oak. One of the bats flew away before I could examine it, the other three were ♂s.

PIPISTRELLE *(Vespertilio pipistrellus)*. This bat is common in Sparham, and so abundant in Cawston church, that Mr. Marsh and I once caught twenty in our butterfly nets in a few minutes.

MOUSE-COLOURED BAT (?) *(V. murinus?)*. A few years ago I wanted specimens of Noctules for a friend, and accordingly I stationed myself, gun in hand, between Sparham church and the River Wensum to watch for a chance of shooting some as they flew from the tower to the river just before dark. For about three quarters of an hour I saw a great many Noctules, most of which flew much too high to shoot. I had four shots, and bagged three Noctules, but could not see to pick up the fourth. I had a good view of a gigantic bat which puzzled me at the time (as I then thought the Noctule had the largest spread of wings). This bat struck me as spreading its wings at least an inch more than any of the other great bats. I mention this that my readers may look out for *V. murinus*. Nearly all Noctules measured by me had a spread of fourteen-and-a-quarter inches, none more than fifteen inches when stretched tight: one was less than fourteen-and-a-quarter inches. Possibly the giant which I saw was only an unusually large Noctule.

REDDISH GREY BAT *(V. nattereri)*. May 5th, 1870, at Sparham I was examining a cole-tit's nesting box (which I had made in an old wall by taking a brick out and putting a wooden lid in instead). It was a hot day and the sun was shining on the wall at about ten minutes to one o'clock, when, as I took out the wooden lid a very lively specimen of *V. nattereri* ♂ tried to scramble out. It was probably disturbed either by ants or by the heat of the wall. Besides the usual shrill squeak of the common bat, this bat made an odd grunting noise when touched; it quickly availed itself of any opportunity of flying out of my hand, even the moment after being re-captured in a butterfly net. Its mouth was slightly open when I caught it, and afterwards.

LONG-EARED BAT *(Plecotus auritus)*. 23rd September, 1875, at 2.45 a.m., a ♀ of this species flew in at the open window of my bed-room. They often do this, but I don't usually note the hour. This species is very common in Sparham. Many years ago I found two young ones in one of my nesting boxes, but I cannot find the note of it. I frequently find one or two old ones in my boxes, and in holes of oak, beech, and whitethorn. May 18th, 1876, in Sparham, Mr. J. E. Cremer gave me a Long-eared Bat (found alive on his grassplot). The dimensions of this specimen were the same as those given in 'Bell's British Quadrupeds,' second edition, *except* extent of wings, ten-and-a-quarter inches; breadth of extended ear, one inch; interfemoral membrane, with a projecting tooth near the end of each spur. Length of tail, one inch nine lines; length of head, ten lines; total length from end of tail to tip of nose (extended), three inches eight lines; length of head and body, one inch ten lines.

May 19th, 1876. In Hockering Wood I found a Long-eared Bat hanging to the rough bark on the south side of an oak tree (on the outside of the trunk).

BARBASTELLE *(Barbastellus daubentonii)*. On the 3rd of January, 1875, Mr. J. E. Cremer gave me a live Barbastelle which he found in a heap of colder, in his barn at Sparham.

On the 8th of March, 1875, I saw at Cawston a small bat with short ears, flying *very* slow and straight, at about five p.m. It was just beginning to rain. At Whitwell, at about six p.m., on the same day, when it was raining hard, I saw another bat larger than the first, but hardly large enough (I think) for a Noctule, also flying *very* slow and straight.

February 3rd, 1878. I saw at Sparham a small bat with short ears, flying about for some time just at dusk in the evening. Its flight was quick and active, and in all directions.

HEDGEHOG *(Erinaceus europæus)*. November 5th, 1875. At Reepham, Mr. F. S. Bircham shewed me a litter of five small young hedgehogs, with white spines, and their mother. I once had two old hedgehogs brought to me, with several (seven or nine I think) young of two sizes: the smaller ones had white spines.

We believed them to be two litters and two mothers, though all were taken from the same hole. I cannot now find the note concerning these, as my diary in those days had no index. I have several times taken young hedgehogs, sometimes only three in number, sometimes as many as five from one nest, always, I think, accompanied with the mother. The above case of *small* young in November, is the only instance I can remember of very young hedgehogs in *winter*. These small white-spined young, appear to be unable to roll up as the older ones do. Mr. Bayfield the gamekeeper at Hockering Wood told me he once saw a litter of six young in one nest.

Mole *(Talpa europæa)*. October 20th, 1874. I examined a large mole-heap in a field of carrots at Beeston Regis. It was about thirty inches in diameter at the surface of the ground, and about twelve inches high in the centre. Just below the surface of the ground in the middle of the heap was a cavity about six inches in diameter; this cavity appeared to be spherical; it was nearly filled with green and withering carrot leaves. I noticed seven runs or tunnels communicating with this nest and radiating from it; one running over it, and one running partly round it and connecting the radiating runs.

March 5th, 1857. I opened two old nests of mole at Oulton. They were in a plantation of mixed trees, were very much alike, and much the same as the Beeston nest in pattern, but I could only find four runs communicating with one, and five with the other. There was part of a circular run round one nest, and a great complication of runs above it; but they were so stopped and compressed in many parts that I could not sketch the exact pattern of every part. Both nests contained dead leaves.

On the 3rd of February, 1876, at Swannington, Old John Keeler (a celebrated mole-catcher) told me that moles usually bring forth four or five young at a birth, but that he had more than once found eight young moles in the body of the mother; that moles generally bring forth young in the end of May, but at Bylaugh they are a month earlier; that their nest is usually placed under a fence or in a plantation, and that it is composed of dead or of green leaves under a *large* mole-heap and entered by several runs in all directions, and these runs are connected by circular runs; but he seemed to

think the pattern of runs varied in different nests. He said he had seen some cream-coloured moles which were taken near Bergh Apton, where one of his sons lives.

March 4th, 1876. I received by post two cream-coloured moles ♂ and ♀, and the skin of another from Oby near Yarmouth. On the 6th another ♀; on the 13th a ♂; another ♂ on the 18th. On the 1st of April, 1876, two more came to hand, all cream coloured, and all from Oby. I have had twelve from that place, and have been aware of the existence of a race of cream-coloured moles in the Oby marshes for many years. Mr. Wiseman of Oby tells me that a white mole and a black mole are sometimes caught in the same run. He does not remember seeing more than two spotted moles. Last year his men turned out several nests of black moles, but none of white moles, nor has Mr. Wiseman ever seen a nest of white moles; they are all caught on the marshes. He says moles have their young in April.

March 22nd, 1876. At Oulton I called on Thos. and Robert Keeler (mole-catchers, related to the Swannington mole-catcher). They told me they catch a good many pied moles at Blickling, near the pond, but no white moles. I saw one of the skins which was of the usual dark colour but with a yellow spot about an inch in diameter on the underside of the flank. They told me the pied moles had seldom more than one or two such spots. They say they have already caught thirty or more pied moles at Blickling; and that moles usually have four or five young at a birth, and sometimes six, in the end of April. A shepherd in Sparham told me he once saw a mole-catcher in Norwich who showed him a lot of moles alive in a box, eight or nine of which were white, and were caught at Fundenhall near Tacolneston. Mr. Bayfield, the Hockering gamekeeper tells me, that a few years ago he saw at Roudham a cream-coloured mole, and that his brother-in-law Amiss who is gamekeeper there, could send me specimens like it. I afterwards had the offer of two such moles killed at Roudham. The soil at Roudham (I am told) is light and sandy, with light peaty meadows. Mr. J. H. Gurney, jun., told me of two white moles killed at Keswick. Mr. T. E. Gunn mentioned the receipt of four at once, from Stalham. A game-keeper at Hoveton told me white moles were caught at Halvergate marshes and Acle Bridge. At Scoulton I met a man who told me that at Methwold

moles have young in March, in mild weather, four, five, and six, at a time, and he has found seven young at once in a nest. Mr. F. Kitton and I have both tested the rusty-coloured fur from the throat of the yellow moles for traces of iron, but without detecting any. We tested it with ferrocyanide of potassium and sulphuric acid. I am told that a mole-catcher at Loddon or Chedgrave, catches white moles there.

May 25th, 1877. At Hockering wood, a woodman told me he found a nest of four young moles, a week or two ago.

October 31st, 1877. On my way from Norwich to Dilham, a fellow-traveller told me there were hundreds of cream-coloured moles at Foulden, near Swaffham.

I spent the 14th of November, 1877, in Foxley wood, where an old friend of the name of Clarke (the head feller of brushwood) told me that in the middle of May, 1875, he found in Foxley wood a nest of six young naked moles, the largest number he ever found in a nest.

March 7th, 1876. Mr. J. E. Cremer brought me a live mole which he caught in the act of burrowing near the surface of the ground; he saw several worms escaping to the surface in front of the mole before he caught it. I put it into a large box with some earthworms and a good large quantity of earth. This mole ate a worm very quickly, holding it with its fore feet. It was very active, hardly ever resting for a minute during the four-and-a-half hours whilst I was present. It made a very small shrill squeak like that of a bat but not so loud. The noise is scarcely audible at the distance of two feet, and is made when the mole is under the surface of the ground, but not when the mole is touched. In burrowing, this mole generally carried its tail erect or turned slightly over its back. In running it made more use of the muscles of its body and hind limbs than of its fore legs, and frequently raised the fore part of the body from the ground by bending its neck and back upwards till the hands were raised off the ground. In burrowing it bores with its snout, shovels away the earth with its hands, and propels itself with its hind legs and the muscles of its body at the same time. It also had the power of scratching its back, or cleaning its fur with one hind foot. It did this very rapidly and without stopping in its work, either running or excavating at the same time. It has been said that the scent of green elder is so disagreeable to

moles, that if a piece of elder be bruised or scraped and put into a mole's run, the moles will desert the place. Without intending to annoy my mole longer than was necessary, I put such a bit of elder into its box, but the mole showed not the slightest sign of dislike to the elder; but applied its nose and hands to the stick, thoroughly examined it, and then tried in vain to climb up it, probably hoping to escape from the box by it. Both the black and the whitish or yellow moles vary much in size, and also in the number of ribs, both having sometimes fourteen pairs, whilst other specimens of both colours have but thirteen pairs of ribs, and some have fourteen ribs on one side and only thirteen on the other side. They vary also in the number of thoracic vertebræ, in the number of caudal vertebræ, and in the number of vertebræ which form the sacrum. Moles have two chevron bones under each inter-vertebral space of the tail. In one specimen which I dissected the anterior caudal vertebra has a spine; but the number of caudal vertebræ is twelve, and the sacrum contains five vertebræ. I have plenty of evidence from other witnesses confirming the above statements as to season and number of young moles, also as to the occurrence of moles pied, entirely rusty coloured, and entirely grey.

SHREW *(Sorex araneus)*. August 11th, 1876. Whilst pupa digging at Foxley wood, I found in a deep hole under the roots of a large oak, a nest of six blind young shrews, apparently of this species. Their tails were moderately long, and were not ciliated; their snouts seemed out of all proportion, and looked as big or bigger than those of old shrews. They reminded me, in their appearance, very much of young moles. They squeaked rather like bats.

I often find the common shrew, and sometimes the oared shrew, lying dead. Some years ago I found in a stubble field from which the corn had just been cut (or carried?), a great number of shrews (I think there were a hundred or more) lying dead: most, if not all, of them had their backs injured, as if each shrew had suffered a single bite or nip across the back. I remember that they varied much in colour and size; but at the time I did not know anything of the different species, and unfortunately I was not sufficiently interested in quadrupeds to make the best use of such an unusual opportunity for comparing specimens.

OARED SHREW *(Sorex remifer)*. I have at different times found this species lying dead—on two or three occasions it was alone; on one occasion a common shrew was lying dead beside the oared shrew. I have never seen the other variety—the water shrew, *S. fodiens*—at least, I have not seen it well enough to recognize it. I noticed many large black-looking shrews amongst the long grass and brambles on the edge of the Fritton lake, but could not catch one.

LESSER SHREW (*Sorex pygmæus*). June 14th, 1874. I caught this species on Sparham heath, late in the evening. At the time, I had seen no description or drawing of it, but after noticing its minute body and very long square tail, I sent it to the editor of the 'Field,' who was good enough to identify it for me.

July 6th, 1874. On the heath near the Beacon hill, between Runton and Felbrigg, I saw two shrews, one of which I believe was of this species, and the other probably *S. remifer*, but I was unable to make sure of either.

OTTER *(Lutra vulgaris)*. I frequently see traces of the otter on the banks of the Wensum river, in Sparham, at all times in the year. By "traces" I mean those well-worn landing-places, and remains of fish. The "seal" and "spraints" I seldom see except when the ground is well covered with snow; and then if the snow is a few inches deep, the broad track made by the otter's body is far more conspicuous than either of the other signs.

January 30th, 1874. A shepherd brought me a young otter ♀ which he had just killed in Sparham. It weighed five pounds, and was two feet three inches long. Mr. Southwell has already shown that this animal has its young in October, November, December, January, and February, and that four is an unusually large litter.

WEASEL (*Mustela vulgaris*). May 16th, 1876. I dissected ten weasels, which were all unfortunately killed in one wheat stack in Sparham, yesterday: three were adult ♂s, three adult ♀s, and four small young ones about a quarter grown, so far as I could see, but one of those four young ones was a ♂. One young ♀ had fifteen ribs on one side, and fourteen on the other side. All the other weasels had but fourteen pairs of ribs each.

ERMINE *(Mustela erminea)*. May 20th, 1876. Mr. Gaff (the game-keeper at Bluestone Wilderness, Heydon) tells me that stoats, polecats, and weasels have as many as nine young at a birth. I have seen no ermines for the last three or four years in their white winter coat. April 15th, 1876. The Hockering keeper told me he caught (three weeks ago) a stoat in which were nine young stoats.

POLECAT *(Mustela putorius)*. April 15th, 1876. I saw hanging up in Hockering wood a large polecat, which the keeper said was a ♀, killed about three weeks ago. They are very rare there, and the game-keeper thought it was a ferret. I feel sure it was a polecat.

CAT *(Felis ———?)*. Large yellowish grey cats with dark stripes breed in Foxley wood. I saw one or two several times, and on one occasion a kitten of the same colour in the wood a year or two ago. I should much like to obtain an old one, to see if they have reverted at all to the wild form, as I fancy they have lived there for many years. 1878.

FOX *(Vulpes vulgaris)*. There seem to be two or three varieties of this beast in Norfolk. Some are much redder than others. I have one which is very grey, and the under surface of body and tail nearly black. They vary much in size and weight also. I found an earth of fox cubs in Foxley wood in 1877, May 2nd. Near the spot were several bits of stick an inch or two in diameter, nibbled into the form of that well-known boys' toy—the "tip-cat." Several square yards of ground were cleared of grass and weeds, and beaten down hard and smooth; in the long grass round this space were several "forms" or hiding-places, so that although I did not see the cubs till some time afterwards, when they were nearly full-sized, I think they must have been born earlier than April. Although foxes have frequently bred in this wood, they hardly ever steal a fowl from their immediate neighbours. Mr. Bush keeps fowls within a few yards of the wood, and when I gave him a hint to shut up his fowls at night last year, he told me he never found that necessary, though he had kept fowls there for many years. Another farmer, who keeps a great number of turkeys and other fowls close to the wood, did not even believe there was a fox in the wood last year, until a day's cub-hunting proved the fact.

The foxes, however, after leaving their nearest neighbours unmolested, come here (three miles off) and kill from twenty to thirty fowls (of all sorts and sizes) in one yard, in one night, as if they had sense enough to know the danger of making enemies near home.

SQUIRREL (*Sciurus vulgaris*). I do not believe the squirrel ever hybernates in this neighbourhood. It may take shelter for a day, perhaps, in stormy, wet weather, but in the coldest weather in winter it seems more active than usual; and I have often seen them and their tracks in such weather along the snowy roadsides and fields at considerable distances from plantations, as if they were migrating from one wood to another.

January 19th, 1876. Sparham. I counted (four times in the day) six squirrels at once in our garden. I saw and counted them almost daily during this winter, in spite of snow and frost, till April, when they became troublesome by getting into our apple shed, and stealing and spoiling the apples at such a rate that it was thought best to destroy our pet squirrels. Squirrels are very fond of thin strips of the inner bark of the lime tree to make their nests with. They prepare (or find) it in such a state that it resembles coarse tow, or rather hemp. In Hockering wood their nests are often made almost exclusively of this material, with a few twigs and sticks outside. I have seen a squirrel's nest of this bark, lining and almost filling a box which was put up in a tree for owls to build in.

August 28th, 1876. I shot a squirrel which had lost a fore-leg, but it seemed quite as active as if it was perfect.

February 20th, 1877. I shot a squirrel as it came running towards me along the Norwich and Fakenham turnpike. I found in its stomach five white tape-worms (each about two inches long); they were between the folds of the intestine, *not in* the intestine. Query—how did they get there?

HARVEST MOUSE (*Mus messorius*). In 1876 I received a harvest mouse alive in March, and a pair in June. The ♀ was larger and redder than the ♂. I kept them alive for several months. They use their prehensile tails in climbing; they use both hands at once in cleaning and in feeding themselves. I made for them a little nest suspended by a fine wire about the size of

sewing thread. One of these mice would frequently climb up this perpendicular wire with great rapidity, often taking both hands off at once and clinging with hind toes and tail, while it swung its head and body out at right angles to the wire in order to try and reach some other object. These mice could readily turn round and descend the wire head first. The hallux and pollex seem to be opposable to the other toes, as I noticed that the wire was generally (if not always) seized between the hallux and the second digit of the hind foot, and, I believe, between the pollex and second digit of the fore foot; but I could not see this quite so distinctly, as the fore feet were either hidden by the head of the mouse, or at other times they never rested a second on the wire. These mice seemed to thrive on the food which I gave them—barley meal, corn, apple, lentils, and flies. They ate frequently, often retiring to their hiding-places for about fifteen minutes at a time, but they did not seem to care for water.

Mouse (*Mus musculus*). March 25th, 1876. Sparham. At the threshing of a wheat stack, I helped to kill about thirty rats and about two hundred mice, among which were several nests of from five to nine young of both rats and mice. Robert Hall, who was present, told me he had seen thirty-five or thirty-six young mice (all alike in size and appearance) in one nest, but he supposed they were more than one litter. It was the general opinion of the men who were at this threshing, that rats and mice bring forth fourteen young (at the most) for one litter.

May 3rd, 1876. Weston Longville. At the threshing of a stack I helped Mr. Fountain to kill nearly a bushel of rats and mice. There was *one nest* containing *thirty-eight young mice*, of three different sizes. I saw it and counted the mice as we took them out of the nest. Fifteen wild white mice were (I am told) caught all together near Mr. Parkerson's stable at East Dereham.

Rat (*Mus decumanus*). May 4th, 1876. The Hockering game-keeper told me he once found a rat's nest (in a swath of fresh cut barley) with seventeen young rats, "just cast," all alike in size and age; and another man told me he once found, in a stack, a nest of seventeen young rats, all of the same size, naked, and about three days old. January 24th, 1877. Mr. Image told me (to-day or yesterday) that he had just opened a rat which contained thirteen

young. This was in the parish of Lyng. February 5th, 1877. Elsing. Mr. Love gave me a very large pied rat (killed on Saturday), and he told me he had taken sixteen unborn rats from one old one.

WATER VOLE (*Arvicola amphibius*). 1878. I obtained a jet-black specimen at Dilham two or three years ago; it was hardly full-grown, and had about three white hairs at the tip of the tail. I have never noticed any other variety alive or in the flesh, except the very common *rusty* black ones. I have seen one other black one stuffed, and one or two albinos stuffed, but none of a grey colour.

FIELD VOLE (*Arvicola agrestis*). I caught a good many of this, and of the bank vole and common shrew—three or four of each—in three pit-falls, which I made larger at the bottom than at the top; several long-tailed field-mice also were thus caught. At East Dereham, on the 30th of March, 1876, a gardener named Doy told me there used to be "lots of" (*i.e.* many) pied (brown and white) short-tailed field-mice in the meadows near where Hy. Farrow lives, at Totwood common, East Dereham.

BANK VOLE (*Arvicola pratensis*). August 20th, 1874. On skinning a bank vole, which a cat had caught, I found in it five young ones. I bagged four bank voles during this month all in Sparham, and one more afterwards at the threshing of a bean stack in the next parish, Bawdeswell. I saw the remains of several other beasts which looked like bank voles, but they may have been field voles. I once caught a very red specimen of (bank?) vole (some years ago) in my butterfly net, on the banks of the Black Water stream, on Whitwell common. The two species (bank and field voles) are so much alike in colour and general appearance, especially the ♂s and young ones, that it is easy to mistake one for the other, and I have no idea which of the two is the rarest.

HARE (*Lepus timidus*). October 7th, 1876. When shooting at Bawdeswell with Mr. Stoughton, his groom (named Jay), who was beating, told us that when he was with the late Rev. Henry Holley, shooting at Scottow with the late Sir Henry Durrant, Mr. Holley shot a very large hare, which Sir Henry gave him. Jay weighed it *after* it was *hulked*—eleven lbs.! Mr. Holley saw it weighed.

Date about 1869 or 1870. In November, 1877, I saw a large hare (in company with other hares of the usual colour): one side of this hare was of a dirty white or cream colour. I could not see the other side. The head, body, and legs appeared to be all of the same light colour.

RABBIT (*Lepus cuniculus*). March 24th, 1859. Sparham. Four young rabbits (not blind) taken from one nest. I saw them.

January 14th, 1876. Sparham. Whilst ferreting rabbits with Mr. Cremer, we pulled out of one rabbit-burrow six full-grown does. Mr. Cremer caught six more rabbits during the remainder of this day and the next day: four of these were does.

[ERRATUM.—In my paper on "Nesting Boxes," at p. 204 of the present volume, line 15 from the top, for "was a nest of hybrid eggs of tame Canada Goose," read "were two nests of hybrid eggs of tame Swan Geese." F. N.]

VI.

NOTES ON THE METEOROLOGICAL OBSERVATIONS

RECORDED AT NORWICH DURING THE YEAR 1877.

BY JOHN QUINTON, JUN., ASSISTANT-SECRETARY,

Registrar to the Norwich Meteorological Society.

JANUARY.

THE period of mild weather which commenced on the 14th of November, 1876, and caused the very unusually high mean temperature of 43.9 in December, was continued throughout January, the thermometer only falling below the freezing point twice, 31.0 on the 23rd, and 31.2 on the 27th; the mean day temperature was 4.6 above the average of the last seven years, and the night temperature 5.3 in excess. The rain which fell on twenty-two days exceeded the average of the last thirty-six years by 9-10ths of an inch, but no heavy rains were recorded. The month was most remarkable for the great barometric variations, attended by heavy

OGICAL REGISTER.

	Mean Temperature.	Rain.	No. of days on which it fell.	WIND. Direction. N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Mean daily Velocity.
WINTER.	°	In.										Miles.
December, 1876 ...	43.9	3.61	19	0	1	8	7	8	4	2	1	179
January, 1877.....	42.8	2.71	22	0	1	2	4	10	6	5	3	206
February, 1877 ...	42.7	1.80	19	0	0	0	0	3	8	11	6	231
Dec. 1876 to Feb.	43.1	8.12	60	0	·2	10	11	21	18	18	10	205
Seven preceding Wi	37.6	5.73	40	6.4	5.6	10.3	7.7	20	17.1	15.6	7.3	184
SPRING.												
March, 1877	40.2	2.07	22	1	2	2	5	2	8	5	6	188
April, 1877	44.5	2.12	11	2	8	6	8	0	3	2	1	205
May, 1877	48.1	1.93	13	10	3	5	3	1	6	1	2	181
March to May,	44.3	6.12	46	13	13	13	16	3	17	8	9	191
Seven preceding Sp	45.7	4.19	34	14.1	8.4	12.0	7.6	8.6	13.3	14.3	13.7	191
SUMMER.												
June, 1877	60.5	1.64	9	0	7	3	2	6	8	1	3	184
July, 1877	61.2	2.67	12	0	0	2	1	4	12	10	2	168
August, 1877	61.0	3.97	16	1	2	4	3	5	10	4	2	176
June to August,	60.9	8.28	37	1	9	9	6	15	30	15	7	176
Seven preedng. Sum	60.0	6.19	34	11	7.3	11.1	7	12.1	15.9	17.7	9.9	169
AUTUMN.												
September, 1877	53.5	2.47	14	3	3	2	1	2	5	1	13	160
October, 1877	49.2	1.81	13	2	2	2	2	6	9	3	5	189
November, 1877...	45.9	2.52	19	0	0	1	1	13	8	5	2	202
Sept. to Nov.,	49.5	6.80	46	5	5	5	4	21	22	9	20	184
Seven preedng. Aut	49.0	7.88	44	6	6	10.3	9.3	18	17.4	15	9	169

gales; commencing with a rapid rise in the barometric pressure from 28.764 at 9 a.m. the 1st, to 29.788 at 9 p.m. the 2nd, attended by a strong S.W. gale, from 1 p.m. to 3 p.m. on the 1st. The barometer fell from 29.788 on the 2nd to 29.154 at 9 p.m. the 4th, and rain fell from 11 a.m. to 8 p.m. on the 3rd. A rise from 29.152 on the 7th to 30 inches on the 10th, was followed by a fall to 29.685 at 3 p.m. the 11th, with a gale of 334 miles, from the N.E. and N.N.E. on the 11th. Frequent, but no remarkable variation was registered until the 19th, when a quick rise from 29.759 to 30.632 at 9 a.m. the 21st was recorded. During the remaining days great variation was recorded, the most remarkable being a fall from 30.018 at 9 a.m. the 29th, to 29.141 at 9 a.m. the 30th, followed by a quick rise to 30 inches on the 31st; with strong gales on the 29th and 30th, of 330 and 542 miles, from the S.W. on the 29th, and S.S.W. until 11 a.m. the 30th, when the wind veered to W., at 6.30 p.m. it veered to W.N.W., and the gale gradually decreased; the greatest hourly velocity of the wind was between 10 a.m. and 2 p.m. on the 30th, when it traversed 28, 29, 31, and 29 miles per hour.

February.

The high temperature which had prevailed during January continued until the 20th of February, causing the mean temperature of February to exceed the average by about 5 degrees: the weather was very wet and stormy, with the sky generally overcast. Strong S.W. and W.S.W. gales were recorded on the 10th and 11th. With the exception of six days, the 20th, 21st, 23rd, and 26th to the 28th, when N.W. winds prevailed, the winds were entirely from the W., S.W., and S. The last nine days, except the 24th, were considerably colder, and slight snowstorms were frequently recorded. A severe N.W. gale was recorded from 10 a.m. to 5 p.m. on the 20th, preceded by a rapid fall in the barometer from 29.845 at 9 a.m. the 19th, to 28.998 at 9 a.m. the 20th, and followed by a quick rise to 29.897 at 9 p.m. the 21st. The barometric pressure again fell to 29.181 at 9 a.m. the 26th, followed by a quick rise to the maximum, 30.289 at 9 p.m. the 28th. Strong W.N.W. and N.W. winds were recorded on the 26th, 27th, and 28th, the daily velocity being 333, 376, and 314 miles respectively; severe wind-frosts were recorded in the nights,

the minimum temperature in the night of the 27th being 20.0. Rain fell on 19 days, but the showers as in the preceding month, were mostly slight, the total fall exceeding the average by only 4-10ths of an inch.

March.

This was a very gloomy and wet month, the sky being generally overcast, and the weather very showery, rain falling on 22 days; but the showers were again mostly very slight, the total fall exceeding the monthly average by only half-an-inch. The mean barometric pressure was unusually low, the readings being below 30 inches from the 12th to the 29th, and from the 24th to the 27th did not rise above 29.500. The mean temperature was about the usual value, but very considerable variation was recorded: the maximum on the 1st was only 35.8, but the minimum on the night of the 2nd was 46.0, followed by a maximum of 51.5 with a light S.W. wind. This was succeeded by a gradual fall in the temperature until the 10th, when the maximum was only 35.6, followed by a minimum of 27.0. The winds were mostly from the N.W., days showery, hail and snow on the 6th, 7th, and 8th. The wind veered to S.W. on the 12th, followed by a quick rise in the temperature, the maximum on the 14th being 55.0. The barometric pressure fell from 30.274 at 9 a.m. the 11th, to 29.580 at 9 p.m. the 12th, attended by strong S.W. and W. gales on the 12th and 13th. From the 15th to the 24th the weather was again cold, and frequent slight showers of rain, hail, and snow, were recorded. The last week was much milder, although very showery: the winds were light from the S.E. and S.W.

April.

April was a very gloomy month, the sky generally overcast, and the day temperatures, with but few exceptions, unusually low. The barometric pressure fell from 29.919 at 9 a.m. the 2nd, to 29.196 at 9 p.m. the 3rd, attended by S.E. winds; the barometer rose slightly on the night of the 3rd, but fell to 29.066 at 9 p.m. the 4th. The 4th was a very fine day with a maximum temperature of 63.5, but in the evening a severe thunder-storm occurred with heavy rain and hail. The following week was very cloudy and showery; hail fell on the 6th, and a slight thunder-storm

occurred on the 7th: the barometer readings averaged about 29.5. Early on the 11th the wind veered to N.W.; a quick rise was recorded in the barometer, and nine very cold days with N. and N.E. winds were recorded; the mean temperature from the 11th to the 19th averaged only 47.4 in the day, and 38.6 in the night. The barometer fell from 30.218 at 9 a.m. the 15th, to 29.670 at 9 p.m. the 17th, attended by a strong E. gale on the 16th, and E.N.E. and N.E. on the 17th and 18th. This was followed by a rise to 30.231 at 9 a.m. the 20th, a very fine day with a maximum temperature of 58.0. On the 21st the maximum was only 45.8; drizzling rain fell from noon until 10 p.m., followed by a heavy shower at 11.30 p.m. The remaining days were very cold with N.E. winds, and no unusual variation in the barometer. The mean barometric pressure was 0.150 in. below the average; the rainfall exceeded the average by 0.58 in.

May.

May commenced with five very cold cloudy days, with N.N.W. and N.N.E. winds; the maximum temperature was only 47.0, and a little snow fell on the 4th. The 6th, 7th, and 8th, were very fine days; the maximum temperature on the 8th was 63.0, but the air was very dry with E. and N.E. winds. From the 9th to the 24th very cold, gloomy, wet weather was recorded; the day temperatures were mostly considerably below the average, the sky was generally overcast, the winds variable, frequent showers of rain; and hailstorms on the 19th. The remaining days from the 25th to the 31st were cloudy, but much milder with W. and S.W. winds. The only remarkable barometric variation in the month was from 30.032 at 9 p.m. the 26th, to 29.163 at 3 p.m. the 28th, attended by a strong gale on the 28th, when the velocity was 344 miles in the 24 hours; and followed by a rise in the barometer to 29.516 at 9 a.m. the 29th. The rainfall was slightly above the average.

June.

This month commenced with a strong S. and S.S.W. gale on the 1st and 2nd, attended by a quick rise in the barometric pressure from 29.407 at 3 p.m. the 1st, to 29.909 at 9 p.m. the 2nd; this was succeeded by fine hot weather with S. and S.W. winds until the 11th, and with a maximum temperature on the

4th of 81.0. The 12th, 13th, and 14th, were much colder, the sky mostly overcast, and the winds light from the E. and N.E. Another period of fine hot weather with light N.E. winds lasted until the 22nd, attended by a fall in the barometric pressure from 29.961 at 9 a.m. the 21st, to 29.477 at 9 p.m. the 22nd, with a heavy shower of rain at 3 a.m. the 23rd, followed by a quick rise in the barometer to 30 inches on the 24th; after which the pressure continued high and steady until the end of the month. The 23rd to the 27th were cold cloudy days, the maximum temperature being only 67.0, with light winds from the N.W. and S.W. The last three days were much hotter, the thermometer rising to 82.8 on the 29th. The mean temperature of the month was about 3.5 degrees above the usual average. The rainfall was 0.13 in. deficient.

July.

July commenced with cold, cloudy, and showery weather; the mean temperature of the first nine days was only 58.4. Rain fell from 3 a.m. to 5 p.m. on the 1st, amounting to 1.06 in. in the fourteen hours; and a severe thunder-storm with rain occurred at 3 p.m. the 7th. The barometric pressure was steady at about 30 inches from the 1st to the 12th, after which it fell from 30.007 at 9 a.m. on the 12th, to 29.188 at 9 a.m. the 15th, attended by a heavy fall of rain from 11 p.m. the 14th to 3 a.m. the 15th, and a rather strong S. and S.S.E. wind on the 15th and 16th. Frequent oscillation was recorded in the last fortnight, but no remarkable variation occurred. The winds were light chiefly from the S. and S.W., the sky generally cloudy, and the highest temperature between the 15th and the 28th, was only 73.5; the thermometer on the 28th only registered 66.0. The last three days were much finer and very hot, the maximum temperatures being 81.0, 80.5, and 85.5; the 31st was a very fine, hot day, but a slight thunder-storm with rain occurred in the evening, and at 9 p.m. the temperature had fallen 15.5 degrees below the maximum. The rainfall for the month exceeded the average by 0.22 in.

August.

August commenced with a thunder-storm and heavy shower of rain at 1 a.m. the 1st. The month was most remarkable for the

excessive rainfall, the total fall being the most recorded in August since 1843: it was 1.83 in. above the average of the last thirty-six years. A fall was recorded in the barometric pressure from 29.875 at 9 p.m. the 6th to 29.494 at 9 p.m. the 7th, followed by a heavy shower of rain from 8 to 11 p.m. on the 7th. A very heavy shower occurred at 5.30 p.m. the 15th, the unusual amount of 0.69 in. falling in twenty minutes; the barometer was steady and the wind light from the S.S.E. Another heavy shower occurred between 8 and 10 a.m. on the 19th, the barometer gradually falling, and continued to fall until 9 a.m. the 21st, when 29.486 was registered, and followed by a S.S.W. and S.W. gale from 9 a.m. to 6 p.m. on the 21st, and a thunder-storm at 1 p.m. the 22nd. On the 28th rain fell from 5 to 10 a.m., followed by a S.W. gale from noon to 8 p.m.

September.

This was a cold and gloomy month, the mean temperature was 3.5 degrees below the average: this deficiency occurred chiefly in the day temperatures, which were about 3 degrees below the usual mean. Mr. Glaisher has stated that this was the coldest September recorded at Greenwich since 1803. The barometric pressure averaged high, being about one-tenth of an inch above the usual value; no remarkable oscillation was recorded. The rainfall was 0.20 in. above the average. This month commenced with two fine bright days; the maximum temperature with a S.W. wind on the 2nd being 66.5; but early on the 3rd the wind backed to N.E., and the maximum temperature was only 58.0. The day was very wet, with much thunder and lightning; the very unusual amount of 1.45 in. of rain was recorded between 9 a.m. and 5 p.m. on the 3rd. On the 4th rain fell from 9 a.m. to 2 p.m. amounting to 0.25 in. The following six days were fine, with light variable winds and barometer very steady at about 30 inches. From the 11th to the end of the month the weather was unusually gloomy, the sky being generally overcast, and frequent showers of drizzling rain; the winds were rather squally from the S.S.W. and S.W. from the 12th to the 15th, and light from the N.W. during the remainder of the month.

October.

The weather during the first week was fine, winds light from the N.E. and E., with high barometric pressure; the very unusually high reading of 30.683 being recorded at 9 a.m. the 6th. The barometer fell from 30.489 at 9 a.m. the 7th to 30.098 at 9 a.m. the 8th, attended by a strong N.W. and N.N.W. gale from 2 a.m. until 10 p.m. on the 8th. On the 10th the wind changed to S.W., and a week of cloudy squally weather with W. and S.W. winds was recorded. The barometer fell from 29.802 at 9 a.m. the 14th to 29.553 at 9 a.m. the 15th, attended by a strong S.S.W. gale from 1 a.m. to 8 a.m., and S.W. from 8 a.m. to noon on the 15th. The barometric pressure increased quickly to 30 inches at 9 a.m. the 16th, and remained high and steady until the 22nd. The last nine days were very wet, with light S. and S.W. winds, and considerable variation in the barometric pressure. The unusual amount of 0.84 inch of rain fell between 9 a.m. and 6 p.m. on the 29th. The total rainfall for the month was 0.89 inch below the average.

November.

This month was most remarkable for the sudden barometric oscillation and low mean pressure, which was 2-10ths below the usual value. The month commenced with a fall from 30.369 on the 1st to 29.909 at 9 p.m. the 2nd, with slight oscillations during the following week, and winds chiefly from the S. and S.S.W. On the 11th the barometer fell quickly from 29.303 at 9 a.m. until about 2 a.m. the 12th; the lowest reading *recorded* was 28.871 at 9 p.m. the 11th. This low pressure was attended by a strong S.S.E. gale from 9 a.m. the 11th until 2.30 a.m. the 12th; the velocity of the wind from 6 p.m. until 2 a.m. averaged 25 miles per hour. The storm ceased most remarkably at 2.30 a.m. on the 12th, the velocity in the next hour being only 7 miles. A very rapid rise in the barometer was next recorded, the readings increasing from 28.930 at 9 a.m. the 12th, to 30.271 at 9 a.m. the 15th; on the 16th the wind veered to N.W., and the barometer reached 30.400 inches. This was followed by another fall to 29.471 on the 20th with S.W. winds. During the last ten days very great variations were recorded in the barometer, the chief being a fall from 29.753 at 9 a.m. the 21st, to 29.007 at 9 p.m. the 22nd, followed by a rise to 29.645 at 9 p.m. the 23rd, and

attended by a strong W.S.W. gale on the 22nd and 23rd, the daily velocity of the wind being 383 and 378 miles. This was followed by other very sudden barometric variations, and the unusually low pressure of 28.865 was recorded at 3 p.m. the 29th. The mean temperature of the month was 4 degrees above the usual average; the rainfall exceeded the average by only 0.18 in.

December.

December was unusually gloomy and damp; the air was generally calm, or light winds chiefly from the W. and S.W. The mean temperature exceeded the average by 2.5 degrees; there was much less variation than usual, the total range being only 24.5 degrees, between 52.0 on the 29th and 27.5 on the 19th. But the day and the night temperatures taken separately show considerable variation, for the lowest temperature on the night of the 16th was only 44.0, but on the night of the 18th it fell to 27.5; and the maximum on the 25th was only 34.0, but on the 29th it reached 52.0, giving a range of 16.5 degrees in the night temperatures, and 18.0 degrees in the day temperatures. The barometric pressure averaged high, the month commencing with a rapid rise from 29.268 on the 1st to 30.167 on the 3rd, with N. and N.E. winds; early on the 6th the wind veered to S.E. and the barometer fell to 29.444 at 3 p.m., this was succeeded by another rise to 30.237 on the 8th. No unusual variation was recorded from the 8th to the 20th, the readings being generally above the average. On the 20th another fall ensued from the unusually high reading of 30.693 at 9 a.m. the 20th to 29.913 at 9 p.m. the 22nd; followed by a further fall to 29.437 at 3 p.m. the 24th, attended by a strong S.W. and W. wind on the 24th. The barometer rose in the night of the 24th, but again fell on the 25th, recording the minimum 29.202 at 9 a.m. the 26th; this was succeeded by a quick rise to 29.996 on the 28th. Snow fell on the evening of the 25th and the 28th. The barometric pressure again fell to 29.481 at 9 p.m. the 30th, followed by rain until 1 a.m. the 31st, which was succeeded by a strong W.N.W. wind until 3 p.m., the barometer rising rapidly to 30.257 at 9 p.m. the 31st. The rainfall exceeded the monthly average by 0.18 in.

The total rainfall for the year amounted to 27.90 inches, and exceeded the average by 4.12 inches.

VII.

ORNITHOLOGICAL NOTES FOR 1877.

By Henry Stevenson, F.L.S.

Read 26th February, 1878.

Occurrences worthy of record, under the above heading have been unusually scarce throughout the past year, its commencement being characterized by an unseasonable mildness and excess of rain, alike prejudicial to the prospects of the sportsman and the collector; whilst later on the penalties now in force under the improved Wildfowl Protection Act, had a salutary effect in checking the slaughter of migratory species; and with a few notable exceptions, killed in the neighbourhood of Yarmouth, to be hereafter mentioned, I know of no casualties infringing upon the law in Norfolk, either inland or on the coast. Except in the fens of the south-western part of the county, Norfolk did not suffer to any great extent from the floods which in January covered so large an area in Lincolnshire, Huntingdonshire, and even parts of Suffolk, but about Feltwell and Lakenheath the amount of water "out" caused great loss to the farmers; the seed corn rotting in the soddened soil, mills stopped, and many hands thrown out of employ, and still, day after day, there was the same leaden sky, and the rain came down with but brief intervals of respite till all was depression and slush! At this time, though the rivers were full, the marshes of the eastern or "Broad" district of the county suffered but little owing to the extreme lowness of the tide at Yarmouth and adjoining parts of the coast, but not so at the close of the month, when the fearful gales on the 29th and 30th, which caused such sad loss of life amongst our smacksmen in the North Sea, broke upon our shores, and lunar influences combined with the hurricane to raise the most destructive tide that had been known, hereabouts, for thirty years. The tidal streams which empty themselves into the sea at Yarmouth and Lowestoft overflowed their banks and inundated an immense tract of marshes,

a considerable portion of which still remained submerged up to the middle of March, the shallow flood having a special attraction for black-headed and common gulls, and immense flocks of lapwings. At Salthouse the tide broke through the sea embankment and poured itself over the once famous marshes at that spot, a former breeding haunt of the avocet. The same remarks as to the mildness of the winter months apply equally to the close as to the commencement of the past year, having been exceptionably unfavourable to the marsh and shore shooter. Amongst the rarer species of fowl that came under my notice in the months of January and February, were an adult male golden-eye, killed near Stalham, a female smew at Berghapton, three fine shelddrakes, and a fine old male goosander, with several immature merganzers.

Gannet. About the 16th of January an adult gannet, storm driven, was taken inland at East Ruston, and another was killed at Cley in the following week.

Black-throated Diver. A young bird was sent into Norwich about the first week in January, and an adult specimen in winter plumage was shot on the mill pond at Hempstead on the 3rd, which had a dozen small perch in its stomach, all under four inches long. An immature bird of the same species was also killed on the 13th of December, as far up the Yare as the entrance of Surlingham Broad.

Sclavonian and Red-necked Grebe. One of the former was shot at Paston on the 1st of January, and another at Yarmouth on the 6th, and a red-necked grebe at Yarmouth about the same time.

Bittern. One was killed at South Walsham on the 15th of January, and towards the end of the month another was seen on Hoveton Broad on several occasions, but it does not appear to have remained much later.

Mealy Redpolls. These uncertain visitants were abundant both before and after Christmas, in the winter of 1876–77. In January, 1877, I received several for my aviary, netted near Norwich, one of which, even then, had a rich rose-tinted breast. None seemed to have visited us at the close of 1877, but siskins were then plentiful.

EARLY APPEARANCE OF BLACKHEADED GULLS AT SCOULTON. As an evidence of the extreme mildness of the weather in February, a flock of about a hundred of these gulls were observed on the 6th of that month, hovering over their usual nesting haunts at Scoulton Mere, but though seen in smaller numbers on the following day, they did not remain. I know of no record of their appearance at this spot so early, though, occasionally a few have made their appearance by the middle or end of February; the usual date of arrival being between the first and second weeks in March. This mild period, however, was succeeded, on the 27th, by a heavy fall of snow and a severe frost.

GREAT GRAY SHRIKE. Mr. Anthony Hamond, of Westacre, informed me that two pairs of these birds were seen at Massingham, in West Norfolk, during the summer, but he is not aware that they attempted to nest there. One was shot at Hunstanton about the second week in March, in the same place where a specimen was procured in the previous year, and an adult female was also shot at Flordon on the 18th of December.

HAWFINCH. One was killed at Yarmouth in January, one at Forncett in February, and two were shot in March at Wacton and Hemblington, whilst two or three were observed about the same time at Feltwell. This extremely shy species appears to be much more generally distributed in this county than is usually supposed.

LESSER SPOTTED WOODPECKER. About the 13th of April an adult male of this species was shot at Elmham.

RAVEN. A single bird was seen at Northrepps, in April, flying inland.

CUCKOO IN REDDISH BROWN PLUMAGE IN SPRING. The occasional appearance of individuals of this species on their return in spring, exhibiting a peculiarly ruddy state of plumage, yet differing much from the ordinary autumnal plumage of the young birds, has been recorded from time to time. The most vivid specimen of this kind I ever saw was killed in May, near Cantley, on the river Yare.

Late occurrence of Fieldfares. About the middle of May a large flock of fieldfares appeared at Sherringham (no doubt coming from the south), and remained about the park for several days. After the main body had left, a straggler was seen by Mr. H. M. Upcher on the 2nd of June.

Little Owl. On the 9th of May one of these small owls (*Carine noctua*) was brought to me in the flesh, having been shot by a gamekeeper at Haverland; but having since ascertained that several of the same species were turned off not long since on Lord Kimberley's estate, near Wymondham, it is impossible to decide if this individual had strayed from that neighbourhood, or had occurred as a genuine migrant.

Golden Oriole. I am informed, on I believe reliable authority, that early in the spring a pair of these birds were seen on the Caister road, near Yarmouth, flying in and out of a plantation by the wayside, one bird striking the observer as particularly brilliant in colour as they flitted on in front of his vehicle, thus affording him a good opportunity of determining a species so attractive in plumage as not to be easily mistaken.

Strange nesting-place of the Brambling. The brambling has never nested in my aviary till this year, although pairing has taken place and household preparations been shown by the desultory carrying about of building materials. This year, however, one hen brambling was more demonstrative than usual in this way, and, to my great surprise, selected a site for her nest at the foot of, and not in, a small fir tree placed on one of the borders of the aviary. After the manner of a skylark, she formed a hollow in the dusty soil, and then carefully lined it with hair, moss, and wool, after which she laid one egg and sat on it for a day or two, when it disappeared; destroyed probably by mice, or other birds, as my skylarks' eggs almost invariably are, in a similar position; and from that time she deserted her nest, which was soon pulled to pieces. It is the more strange that this strictly arboreal species should have selected such a spot for her nest, as a linnet was sitting on eggs in the fir bush above her head, and a hen chaffinch was doing her best to prompt her deficient instincts, by building in a bush opposite.

Hooded Crow in Summer. Amongst the species one would least care to acclimatise, from its egg-stealing proclivities, the "hoody" ranks supreme, yet we seem to have yearly more and more evidence of its inclination to do so. On August 6th a very accurate observer, at Northrepps, saw a hooded crow drive from her nest a wood-pigeon, which made considerable resistance, and then devour the eggs. A young hooded crow, recorded by Mr. J. H. Gurney, jun., in 'The Zoologist' for 1877, p. 445, as shot by himself at Northrepps on August 20th, having been previously seen on the 18th, had most probably been reared in the neighbourhood, as undoubtedly were a young brood seen at Sherringham, an adjoining parish, in August, 1867, as recorded by myself on the authority of Mr. H. M. Upcher, in the 'Zoologist,' 2nd series, p. 1012, a fact which had quite slipped my memory when I remarked of this species in my last year's notes, that I was not aware of an authentic instance of its nesting in Norfolk.

Norfolk Plover. I am glad to report, with regard to this interesting species, that protection in the breeding season is effecting the desired object, and considerable numbers are again to be met with in their chief haunts in this county. A pair have also been known to rear their young this summer in a very favourable locality some twelve miles from Norwich, where they had not been known to do so for many years. An unusually light-coloured variety, and somewhat undersized, was shot on the 16th of March at Shimpling, near Diss.

Wild-fowl breeding in Norfolk. The early "close time" told well for various kinds of fowl in Norfolk during the past summer, and that not only in the strictly preserved localities, but in places where, hitherto, they have been much harassed. A considerable number of garganey were reared about Surlingham, and in the same locality on the 16th August I saw a "coil" of at least twenty common teal making for the Broad at sunset. A pair of shovellers also nested there this year, which they have not done for some years. In West Norfolk, Mr. Hamond tells me that some wigeon remained all the summer on the lake at Narford, and the gadwall bred freely in that locality. Two broods of young Shelddrakes made their appearance on the estuary of the Lynn

river, some of which were captured and turned off on a pond in that neighbourhood. These were, of course, old enough to take care of themselves; but I have recently heard, through a gentleman well acquainted with these birds in a wild state, as a few pairs still breed annually on his sand-hills in the neighbourhood of Lynn, that although, when eggs are taken and hatched out under tame ducks or hens, the young are easily reared, if young wild Shelddrakes are captured and placed under the charge of the same foster-parents, with nestlings of their own kind and age, they are never brought up to maturity; refusing the food supplied, when once they have known their own mothers and their habits and diet.

GREEN-BACKED GALLINULE *(Porphyrio smaragdonotus).* In my last year's notes, I recorded the first-known occurrence of the Green-backed Porphyrio in Norfolk, a bird killed at Tatterford, on the western side of the county. Since then, two other specimens have been procured in the "Broad" district. One of these was shot on the 6th of September, 1877, in the marshes bordering upon Hickling Broad, and there is little reason to doubt was an escaped bird from Mr. Gurney's residence at Northrepps, he having lost one of his African specimens during the summer. The distance is inconsiderable between the two places and the wilderness of reeds about Hickling and Potter Heigham would form a special attraction. The second example was shot on the 1st of November, upon the swampy ground between Stalham and Barton Broad. When shewn to me in the flesh on the following morning, I found it like the other in perfect plumage, the feet and claws clean and sharp, but this is also the case with Mr. Gurney's specimens, although they have now been some time in confinement. If the Tatterford Gallinule may be considered a genuine migrant, there seems no reason why the Barton bird should not be considered so as well.

EARLY APPEARANCE OF THE SNOW BUNTING. I saw a single bird of this species this autumn, which had been shot here as early as the 19th of September, still showing many traces of its summer plumage.

MANX SHEARWATER. On the 15th of September, a bird of this species was sent up to Norwich to be stuffed, but I could not learn in what part of the county it had been killed.

RICHARDSON'S SKUA. An immature specimen was shot at Blakeney about the 18th of September.

BLACK AND WHITE STORKS. An adult female of this extremely rare visitant to the Norfolk coast, was shot on Breydon Mud Flats on the 27th of June; and a fine male of the White Stork was also shot at Burgh, near Yarmouth, on the 23rd of May.

SPOONBILL. A single immature specimen was killed at Yarmouth somewhat earlier in the spring than the white storks; and another was said to have been seen on Breydon in the middle of September.

HOOPOE. In my notes for 1875—76 (vol. ii, part 2) I referred to the scarcity of this species, whether as a spring or autumn migrant to our coast of late years, nor can I at all account for the change. Mr. T. E. Gunn records in a local publication a specimen shot at Filby, near Yarmouth, in October, 1877.

BLUE-THROATED WARBLER. Though not actually procured in Norfolk, having been taken on the Lowestoft Denes, the example of this warbler recorded by Mr. G. Moore, in the 'Zoologist' (3rd series, vol i, p. 449) as entangled in some nets, in July last, is most interesting to local ornithologists, as it proved to be the Scandinavian form of this species, as also were,—one taken under very similar circumstances, and near the same spot, at Lowestoft, in May, 1856; another found dead on Yarmouth beach in September, 1841; and a third recorded in the 'Zoologist' for 1867 (p. 1014) by Mr. J. R. Griffith, of Oxford, as identified by himself as it alighted, on the 1st of September of that year, upon the rigging of the steamship "North Star" when off the Norfolk coast; the vessel bound at the time from Christiania to London.

WOODCOCK. We had no woodcocks to speak of till after the 24th of November, when, after a long continuance of S. and S.W. winds, a change took place suddenly to the N. and N.W. with a slight frost. A good sprinkling was then reported from various parts of the coast, and others were met with later on. Five or six couples were exhibited for sale in Norwich market on the 1st of December.

MIGRATORY WADERS. I am informed that about the 18th of September when, after a prevalence of winds from S. and S.W., there was a change to N. and N.W. for a few days, the "muds" of Breydon were frequented by an immense number of grallatorial migrants of various kinds. Of birds then procured may be mentioned two SPOTTED REDSHANKS and several PIGMY CURLEWS. A pair of the latter species in nearly full summer plumage were also killed at Blakeney, in the first week of August, and two more SPOTTED REDSHANKS were shot on Breydon on the 12th and 22nd of October; one a darkish bird in change of plumage, and the other a bird of the year.

LATE APPEARANCE OF THE SWALLOW. A young bird fell down the shaft of a chimney in this city on the 9th of December.

RAPTORIAL MIGRANTS. SEA EAGLES appear to have been as scarce on our coast in 1877 as they were plentiful in the winter of 1875—76. I have heard of but one, said to have been seen on the 22nd of November, in the parish of Burlingham. Of OSPREYS, an adult bird was shot at Morston on the 12th of May, and a younger bird on Breydon wall on the 21st; about the close of the same month one was also observed at Hoveton, perching on some oaks on Mr. Blofeld's lawn, most probably the same bird which was seen at Coltishall a few days later. A single MERLIN was seen at Northrepps on the 5th of January, and on the 7th of May a HOBBY was observed in the same locality, and another on the 8th of November (an unusual date for this species) was seen going inland.

Amongst the rarities of the year must, specially, be mentioned the KITE, of which now scarce species in this county, an example was seen by Mr. J. H. Gurney on the 7th of January, soaring above his residence and garden, at Northrepps, and on the 18th I saw in the flesh a kite which was said to have been killed by some woodmen at work in a plantation, at Sherringham, on the 15th, probably the same bird. A claw was missing from one foot, and something like rabbit's down adhered to the torn end of the toe, though dry and healed. The unusually worn state of the tail feathers and primaries in connection with the injured foot, seemed to indicate a narrow escape from a steelfall, and the circumstances of its death and its wasted condition seemed to indicate some

further wound. Another was reported to have appeared in the same neighbourhood, about the same time, but was not procured. On the 2nd of May, Mr. J. H. Gurney, Junr., also, saw a kite at Northrepps, flying high overhead, in company with two buzzards, and pursuing a southerly direction. The time of year was as remarkable as the line of flight. This bird was plainly identified in the strong sunlight by its forked tail and peculiar flight. ROUGH-LEGGED BUZZARDS, have not been numerous this year. One was said to have been killed at Long Stratton on the 6th of January, and another was trapped at Hempstead, near Holt, on the 8th, which contained the remains of a pheasant and a chaffinch in its stomach. At Yarmouth, a fine female was killed on the 22nd, and on the 29th a specimen, which had been dead some time, was picked up at Northrepps, near Cromer. All these were in immature plumage. Of the COMMON BUZZARD, I have the following notes chiefly from the coast near Cromer. On the 14th of April, one was trapped at Northrepps, and another was seen going south at a great height, on the 27th. The two seen by Mr. Gurney, Junr., on the 2nd of May, with the kite, were most probably of this species; and on the 5th of the same month a very dark specimen was shot at Sprowston, near Norwich; and again at Northrepps, on the 27th and 30th, single birds of this species were observed passing in a southerly direction. On the 10th of November, one was also seen at Northrepps. Of the HARRIERS, may be noted, a large white-headed hawk,supposed to have been a marsh harrier, which, on the 5th of May, flew over the Selbrigg pond, at Hempstead, causing much disturbance amongst the fowl; and on the 23rd of October, one was shot at Hoveton. Of MONTAGU'S HARRIER, a male in change from brown to grey plumage was killed in this county, and sent to London to be preserved, as recorded in the 'Field' of the 25th of August. A SHORT-EARED OWL was seen at Northrepps as late as the 26th of May, and another had been flushed from some rough ground in the same parish on the 13th of April. This bird flew out to sea after circling round at a great height. In the 'Zoologist' for 1877 (3rd series, p. 228), Mr. Gurney has recorded the fact of a short-eared owl being seen on the 3rd of April, at Northrepps, to attack a pair of partridges on the ground, the remains of some three or four others having been found near the same spot, which

like the instance I recorded in last year's 'Transactions' (p. 323) of a short-eared owl being killed when attacking a lapwing, seems to indicate that these birds prey on something more than rats, mice, and small birds. It may be urged, however, in their favour, if accused of killing game, that these occurrences took place in the months of March and April, when undoubtedly neither rats nor mice would be so accessible as on the closely mown marshes in autumn and winter. A bird of this species was shewn me by a Norwich birdstuffer, which had been brought to him in the flesh as early as the 3rd of August, and was said to have been killed close to the city, near the Newmarket Road.

VIII.

MISCELLANEOUS NOTES AND OBSERVATIONS.

Supposed Occurrence of the Squacco Heron in this Country in Winter.—In 1820, a squacco heron was caught in a bow-net, which a fisherman, following the calling of his trade, had hung out to dry at Ormesby broad in Norfolk. It was the second specimen recognised in Britain. A rather particular interest attaches to it not only for this reason, and not only from the singular mode of its capture, but because of the time of the year when it happened, for according to statements made in Pagets' 'Natural History of Yarmouth' (p. 7), and 'The Globe' London Newspaper of December 4th, 1820, it was killed in the middle of winter, viz., in the month of December, and this account has met with support from Mr. Stevenson (see 'B. of Norf.', ii, p. 152), who, as will be seen by reference to his work, gives the *pros* and *cons*, and dwells at some length on the point. Now I think I have alighted on a passage in the 'Zoologist' which enables me to fix the real date at which this heron did occur; for on turning to p. 79 of the 1st vol. I find a good description of the very bird by Mr. Dowell, which I think will show that the right date was the 20th of July, which is what

Mr. Youell gives in the 'Linn. Trans.' (xiii, p. 617), and which is in accordance with the other examples which have occurred in England since: see the list in Harting's 'Handbook of British Birds,' p. 149, where particular allusion is made to this Ormesby occurrence. I will give one extract from Mr. Dowell's description. He says (l.c.) :—"From the back of the head grew seven or eight feathers, each between five and six inches long," which, let the bird have been killed when it may, is incontestably what has always been regarded by ornithologists as the nuptial plumage, or plumage peculiar to summer. These long plumes are lacking in winter. Three squacco herons in my collection which were killed in Africa (two in Transvaal and one in Egypt) are destitute of them, and this is because they are in winter dress. I am sorry to have taken up so much space, but I think it very important to get the correct date, and as it refers to a Norfolk bird I thought you would like to have my note about it.—J. H. Gurney, Junr., 29th May, 1877.

Woodcocks Drowned whilst Migrating.—From the 'Norwich Mercury' of 11th November, 1786 :—"A letter from a gentleman at Manningtree in Suffolk says that the master of a collier from Newcastle thither, assured him that on the 2nd of October last, being within a few leagues of Easton Ness, on the coast of Suffolk, he sailed through water which appeared unusually black, and on inspection it was found to be occasioned by a vast number of drowned birds, and those birds woodcocks; it is conjectured that being on their annual journey over hither, they were unable to accomplish it by reason of the very strong westerly winds we had about that time, and being worn out by fatigue before they could reach the land, perished in the waters."—J. H. Gurney, March, 1878.

Natural History Notes from Churchwardens' Accounts.—The following extracts from the Churchwardens' accounts of the parish of Sprowston, communicated to the Norfolk and Norwich Archæological Society by the Rev. W. J. Stracey, in February, 1846, may be interesting to the members of the Naturalists' Society, as they show us how our ancestors by a kind of poll tax tried to keep down the numbers of some of the birds and animals, to which the woods and unreclaimed lands at that time afforded a very complete protection :—

		£	s.	d.
1665	For bird lime 4d.; for powder and shot 1s. 6d.	0	1	10
1702	For Kyling the cardows in the church - -	0	1	0
1715	Paid for Killing 14 foxes in our woods, to Sam Lemon - - - - - -	0	14	0
1719	For Kyling the Vermint in the church - -	0	2	0
1723	Paid Denmark for Kylling 15 foxes; paid Tubby for a hedgehog - - - -	0	15	6
1724	And for getting 10 foxes and a badgerd, and 2 doz. caddows - - - - - -	0	11	6
	125 foxes Killen between 1715—74 at a 1s. a head			

And the following from the Town Book of the Parish of Stockton, near Loddon, Norfolk, communicated by George Alfred Carthew, Esq., shews that the custom was not confined to one district only:—

1686—7	Item. Laid out to Hennery Mickleburgh for shooting of 4 dozen & a halfe of Cadowes off ye Church - - - - - -	0	6	0

And from the Watton Town Book from a letter to Dawson Turner, Esq., from Thomas Barton, Esq., 2nd June, 1851:—

		s.	d.
1589	Item. To Nycolas Kock for twenty molls heds		xx
	Item. To Rychard Edhouse for xxix dussen Sparrows heds - - - - - -		
	Item. To Thomas Smythe for xxxiii Cadows heds		

In the Parish accounts of Foulsham, too, are items for the destruction of hedgehogs, at 2d. each; also for Caddows killing.

The Archdeacon's Visitation Book for 1662, tells us that at Ranworth "the doves come into the church there and defile the same, to the annoyance of the Prishners there," but I dont find that they were at any expense to get rid of them.—J. T. Todd, 25th March, 1878.

IX.

FAUNA AND FLORA OF NORFOLK.

PART VIII. HEMIPTERA.

(HETEROPTERA AND HOMOPTERA).

BY JAMES EDWARDS.

Read 27th January, 1878.

HAVING devoted a considerable amount of time and attention to the study of this order of insects, I have pleasure in placing at the disposal of the Society a list of the Hemiptera of this county, as complete as circumstances will permit, although I consider it capable of considerable extension when the northern and western parts of the county shall have been thoroughly worked, as my own captures which form the bulk of the list were mostly taken within a radius of six miles from the city of Norwich.

In noticing the sources of my information, I must express my regret that they are not more numerous.

The first in chronological order is Paget's 'Sketch of the Natural History of Great Yarmouth and Neighbourhood,' published in 1834, but many of the localities there given are in the county of Suffolk, and as it is desirable in a list of this kind to have a definite limit of some sort, I have been careful to admit only those insects to which a Norfolk locality is specially assigned. Curtis, in his 'British Entomology,' vol. vii., 1836—1837, has recorded some Hemipterous insects as occurring in Norfolk which I have not at present met with, but *Scutellera lineata, Lin.* of which he says "One, if not more specimens were found several years since by Dr. Lindley, in a nursery garden at Catton in Norfolk," is not an indigenous species, and was in all probability introduced with foreign plants. The 'British Hemiptera' of Messrs. Douglas & Scott, from which I have taken a few notices, and the 'Entomologist's Monthly Magazine,' complete the list of my resources in the shape of printed matter.

In acknowledging the assistance of entomological friends, my best thanks are due to Messrs. Douglas & Scott for their great kindness in determining the many insects which I have from time

to time had occasion to submit to them. To Mr. F. Norgate of Sparham, and Mr. T. P. Dossetor of this city, I am indebted for many good things, and to the Rev. J. Landy Brown for a specimen of that rare water Hemipteron *Aphelochirus æstivalis, Fab.*

The nomenclature and arrangement which I have adopted, is that of the 'Catalogue of British Hemiptera', recently published under the auspices of the Entomological Society of London.

HETEROPTERA.

SEHIRUS BICOLOR. Linn. Eaton.

„ ALBOMARGINATUS. Fab. Arminghall.

CORIMELÆNA SCARABÆOIDES. Linn. Scarce—Sandhills near Burnham (Douglas & Scott); near Norwich, Mr. Dossetor.

ODONTOSCELIS FULIGINOSA, Linn. "Mr. Skrimshire took it once on the Sandhills at Burnham in Norfolk:" Curtis.

ÆLIA ACUMINATA. Linn. "On long grass at Caister marrams near Great Yarmouth in June:" Curtis.

PODOPS INUNCTUS. Fab. Chalk pit at Eaton, one example.

PENTATOMA VIRIDISSIMA. Poda. "On firs, very common:" Paget's 'Yarmouth.'

PODISUS LURIDUS. Fab. Scarce—near Sparham, Mr. F. Norgate.

PICROMERUS BIDENS. Linn. Not common.

TROPIDOCORIS RUFIPES. Linn. Common everywhere.

PIESTODORUS LITURATUS. Fab. Common on Furze.

ACANTHOSOMA GRISEA. Linn. Common on birch.

„ DENTATA De Geer. Not uncommon on birch.

„ HÆMORRHOIDALIS Lin. Scarce—I took a female at Ringland, 2nd April, 1877, and have another from Mr. Norgate. "Rather rare:" Paget's 'Yarmouth.'

DASYCORIS HIRTICORNIS. Fab. Mousehold Heath, Mr. Dossetor.

THERAPHA HYOSCYAMI. Linn. "Caister Marrams on *Ononis arvensis*, August, rare:" Paget's 'Yarmouth.'

MYRMUS MIRIFORMIS. Fall. "Near Norwich:" Curtis. "Caister Marrams, abundant:" Paget's 'Yarmouth.'

CHOROSOMA SCHILLINGI. Schill. "Caister Marrams on *Arundo arenaria*, abundant:" Paget's 'Yarmouth.'

ALYDUS CALCARATUS. Linn. Mousehold Heath, by sweeping.

BERYTUS CLAVIPES. Fab. "Not uncommon in Norfolk:" Curtis.

CALYPTONOTUS PINI. Linn. Near Norwich, Mr. Dossetor.
„ PEDESTRIS, Panz. Common under bark throughout tl Norwich District.
SCOLOPOSTETHUS ADJUNCTUS. Doug. & Scott. Common by sweepin
„ AFFINIS. Schill. Ringland.
„ ERICETORUM. Leth. Common at roots of heath.
„ CONTRACTUS. Schäff. Ringland, by sweeping; commo on one occasion only.
PERITROCHUS LUNIGER. Schill. Abundant in moss.
GASTRODES FERRUGINEUS. Linn. On Scotch fir, Beeston Park.
TRAPEZONOTUS AGRESTIS. Fall. Postwick, Mr. Dossetor.
DRYMUS SYLVATICUS. Fab. } Very common.
„ BRUNNEUS. Sahl. }
RHYPAROCHROMUS DILATATUS. Schäff. Near Norwich, Mr. Dossetor
„ PRÆTEXTATUS. Schäff. "The middle of May, Mouse hold Heath, near Norwich, and Thetford Warren amongst short grass:" Curtis.
PLINTHISUS BREVIPENNIS. Latr. "Sandhills, not uncommon: Paget's 'Yarmouth.'
HYPNOBIUS MICROPTERUS. Curt. }
STYGNOCORIS SABULOSUS. Schill. } Mousehold Heath.
„ ARENARIUS. Hahn. }
ACOMPUS RUFIPES. Wolff. Marshes at Eaton, not rare.
PHYGADICUS URTICÆ. Fab. Lynn, Mr. Bridgman.
NYSIUS THYMI. Wolff. Crostwick, Ringland.
ISCHNORHYNCHUS RESEDÆ. Panz. Stratton Strawless, abundan on birch at Ringland, September, 1877.
„ GEMINATUS. Fieb. Mousehold Heath.
CYMUS CLAVICULUS. Fall. Marshes at Eaton.
„ MELANOCEPHALUS. Fieb. Ringland.
„ GLANDICOLOR. Hahn. Framingham Earl.
PIESMA LAPORTEI. Fieb. Common by sweeping.
AGRAMMA LÆTA. Fall. Dunston Common.
MONANTHIA HUMULI. Fab. Damp places, Arminghall, Eaton I have a variety in which the first joint of th antennæ is entirely black.
„ DUMETORUM. Schäff. Stratton Strawless.
„ CARDUI. Linn. Very common on thistles.
DEROPHYSA FOLIACEA. Fall. Near Norwich, Mr. Dossetor.
DICTYONOTA CRASSICORNIS. Fallen. Hellesdon.

ORTHOSTIRA CERVINA. Germ. Rare—Swanton Morley, in moss.
„ OBSCURA. Schäff. Common in moss.
BRYOCORIS PTERIDIS. Fall. } Common on *Pteris*.
MONALOCORIS FILICIS. Linn. }
MIRIS LÆVIGATUS. Linn. Abundant.
„ CALCARATUS. Fall. Not common.
„ ERRATICUS. Linn. Common.
„ RUFICORNIS. Fall. Rather common
LEPTOPTERNA DOLOBRATUS. Scop. Swanton Morley, Postwick.
PHYTOCORIS DISTINCTUS. Doug. & Scott. Trowse, on willow.
„ TILIÆ. Fab. }
„ POPULI. Linn. } Abundant.
„ DIMIDIATUS. Kirsch. }
„ FLORALIS. Fab. Local—Hellesdon, on hazel.
„ ULMI. Linn. Common.
DERŒOCORIS STRIATELLUS. Fab. Ringland.
„ BIPUNCTATUS. Fab. Common.
„ BINOTATUS. Fab. Very abundant.
„ ROSEOMACULATUS. De Geer. Swanton Morley, Postwick.
„ INFUSUS. Schäff. Beeston Park, on oak.
PANTILIUS TUNICATUS. Fab. Very common on birch, &c., in autumn.
LITOSOMA DIAPHANA. Kirsch. Cringleford, August.
„ STRIICORNIS. Kirsch. On Lombardy poplar, Cossey; and Heigham on willow.
„ NASSATA. Fab. } Common on alder.
„ FLAVINERVIS. Kirsch. }
„ CONCOLOR. Kirsch. Common on broom.
„ ERICETORUM. Fall. Mousehold Heath, common.
„ PRASINA. Fieb. Trowse, on willow.
„ CHLOROPTERA. Kirsch. Common on furze.
AËTORHINUS ANGULATUS. Fall. Abundant everywhere.
SPHYROPS AMBULANS. Fall. Ringland, by sweeping.
„ CARICIS. Fall. Rare—Stoke Holy Cross.
BYRSOPTERA RUFIFRONS. Fallen. Hellesdon, Dunston.
PHYLUS AVELLANÆ, Schäff. Hellesdon.
PILOPHORUS CINNAMOPTERUS. Kirsch. On fir, Sprowston, Trowse.
GLOBICEPS FLAVOMACULATUS. Fab. Swanton Morley.
„ FLAVONOTATUS. Hahn. Common on oak and sallow.
CAMPYLONEURA VIRGULA. Schäff. Common on whitethorn at Cossey, very abundant in July.

IDOLOCORIS PALLICORNIS. Fieb. On *Stachys*, Ringland, October, but undeveloped form only.

„ GLOBULIFER. Fall. Ringland.

„ PALLIDUS. Fall. Common by sweeping in damp places.

MALACOCORIS CHLORIZANS. Panz. On hazel; not uncommon in August and September.

MACROCOLEUS MOLLICULUS. Fall. Common on *Achillaæ*.

TINICEPHALUS OBSOLETUS. Doug. & Scott. By sweeping; common and generally distributed.

PLAGIOGNATHUS VIRIDULUS. Fall. } Abundant on nettles &c.
„ ARBUSTORUM. Fab. } everywhere.

PSALLUS BETULETI. Fall. On alder, Heigham.

„ VARIABILIS. Fall. Keswick, on oak.

„ ROSERI. Schäff. Eaton.

„ ALNICOLA. Doug. & Scott. Cossey.

„ SALICIS. Kirsch. Stratton Strawless, Ringland.

„ LEPIDUS. Fieb. Common on ash.

„ ROSEUS. Fab. Trowse.

„ DISTINCTUS. Fieb. Common on oak.

AGALLIASTES PULICARIUS. Fall. Hellesdon, Yarmouth.

HETEROTOMA MERIOPTERA. Scop. Common on nettles, &c.

RHOPALOTOMUS ATER. Linn. Hellesdon.

CAPSUS CAPILLARIS. Fab. Common in gardens, &c.

„ SCUTELLARIS. Fab. Very rare—Hindolveston, near East Dereham, Dr. Power.

CHARAGOCHILUS GYLLENHALI. Fall. Cossey.

CAMPTOBROCHIS PUNCTULATUS. Fall. On maple, Ringland.

LIOCORIS TRIPUSTULATUS. Fab. Very common on nettles, &c.

ORTHOPS KALMI. Linn. Common by sweeping, &c.

„ CERVINUS. Schäff. Common on ash, &c.

„ PASTINACÆ. Fall, Norwich.

LYGUS PABULINUS. Linn. On nettles, &c.; very common.

„ LUCORUM. Meyer. } Common by sweeping.
„ SPINOLÆ. Meyer. }

„ CONTAMINATUS. Fall. Cossey.

„ RUBRICATUS. Fall. On fir, Stoke.

„ PRATENSIS. Linn. Common on nettles, &c.

PÆCILOSCYTUS UNIFASCIATUS. Fab. Cossey.

HARPOCERA THORACICA. Fall. Ringland.

LOPUS GOTHICUS. Linn. Dunston Common.
ZYGONOTUS PSELAPHIFORMIS. Curt. Cossey, Swanton Morley.
TETRAPHLEPS VITTATUS. Fieb. Arminghall.
ACOMPOCORIS NEMORALIS. Fab. Everywhere common on fir trees
„ ALPINUS. Reut. Rare—one example on fir in a plantation at Sprowston, Mr. Dossetor.
TMETOSTETHUS PUSILLUS. Schäff. Bramerton.
ANTHOCORIS NEMORUM. Lin. } Common everywhere by beating,
„ NEMORALIS. Fab. } sweeping, &c.
„ SAROTHAMNI. Doug. & Scott. Hellesdon, Eaton, on broom.
LYCTOCORIS CAMPESTRIS. Fab. Eaton, Lakenham.
TRIPHLEPS NIGER. Wolff. On flowers of furze, Mousehold Heath.
„ MINUTUS. Linn. Common by sweeping.
XYLOCORIS ATER. Duf. Norwich, under bark of fir posts.
ACANTHIA LECTULARIA. Linn. Doubtless common; but owing to the reticence of those best acquainted with it, specimens are somewhat difficult to meet with.
„ COLUMBARIA. Jenyns. "In pigeon cots, Norwich."
CERATOCOMBUS COLEOPTRATUS. Zett. Rare—among moss, Ditchingham, in August, Dr. Power.
SALDA PILOSA. Fall. Burnham, Norfolk, Curtis.
„ ORTHOCHILA. Fieb. Norwich.
„ CINCTA. Schäff. Trowse, Whitlingham.
„ SALTATORIA. Linn. Ringland.
„ COCKSI. Curt. Heigham.
PLŒARIA VAGABUNDA. On fir; Stratton Strawless, Ringland.
REDUVIUS PERSONATUS. Lin. "Flying to lights in the evening in August, rare," Pagets' 'Yarmouth.' Norwich.
NABIS APTERUS. Fab. Caister marrams, September, abundant: Paget's 'Yarmouth.' Eaton, Thorpe, Crostwick.
„ MAJOR. Costa. Stoke, Eaton.
„ ERICETORUM. Scholz. Mousehold Heath, Arminghall.
„ RUGOSUS. Linn. Earlham, Crostwick.
„ FERUS. Linn. Eaton, Earlham.
GERRIS THORACICA. Schum. Heigham, ditches.
„ LACUSTRIS. Linn. Ponds and ditches everywhere.
„ ARGENTATA. Schum. Wet moss, Arminghall.
VELIA CURRENS. Fab. } Common in ditches, the
MICROVELIA PYGMÆA. Duf. } undeveloped form only.

HEBRUS PUSILLUS. Fall. Wet moss, Arminghall.
HYDROMETRA STAGNORUM. Linn. Common in ponds and ditches.
APHELOCHIRUS ÆSTIVALIS. Fab. Rare—Cossey, Rev. J. L. Brown, Earlham.
NAUCORIS CIMICOIDES. Linn. Common in ditches.
RANATRA LINEARIS. Linn. "They have been taken in Norfolk:" Curtis. My friend Mr. Norgate recognized the figure of this species in Messrs. Douglas & Scott's work, as that of an insect of which he took a specimen some years since near Sparham, but which was unfortunately placed in a case of stuffed birds, and therefore is not now accessible.
NEPA CINEREA. Linn.
NOTONECTA GLAUCA. Linn. } Very common in ditches.
PLÆA MINUTISSIMA. Fab.
CORIXA HIEROGLYPHICA. Duf. Arminghall.
" SAHLBERGI. Fieb. Thorpe, Ringland.
" LINNEI. Fieb. Framingham.
" FOSSARUM. Leach. Whitlingham, Framingham.
" LIMITATA. Fieb. Ditchingham, August, Dr. Power,
" STRIATA. Fieb. Arminghall, Thorpe.
" DISTINCTA. Fieb. Thorpe.
" FABRICII. Fieb. Postwick.
" MÆSTA. Fieb. Trowse, Arminghall.

HOMOPTERA.

CIXIUS NERVOSUS. Linn. Cossey.
" PILOSUS. Oliv. Common on oak, &c.
ISSUS COLEOPTRATUS. Fab. "I have taken it in Norfolk:" Curtis.
ASIRACA CLAVICORNIS. Fab. Scarce—Earlham, one example by sweeping.
LIBURNIA FUSCOVITTATA. Stol. Arminghall, one example.
" FORCIPATA. Boh. Ringland.
" PELLUCIDA. Fab. Common in damp places.
" EXTRUSA. Scott. Cossey.
" FIEBERI. Scott. Ringland.
" LIMBATA. Fab. Common by sweeping.
DICRANOTROPIS HAMATA. Boh. Dunston common.
PHILÆNUS SPUMARIUS. Linn. Very abundant.
" CAMPESTRIS. Fall. Stratton Strawless.

PHILÆNUS EXCLAMATIONIS. Thun. Stratton Strawless.

„ LINEATUS. Linn. Common.

CENTROTUS CORNUTUS. Linn. Locally plentiful in Foxley Wood: Mr. F. Norgate.

LEDRA AURITA. Linn. Fulmodestone Severals, and Foxley Wood: Mr. Norgate. Ringland.

ULOPA RETICULATA. Fab. Felthorpe Common, Mousehold. Probably everywhere at the roots of furze.

MEGOPHTHALMUS SCANICUS. Fall. Common by sweeping in marshy places, and in moss in winter.

ACOCEPHALUS RUSTICUS. Fab. Very common by sweeping.

„ ALBIFRONS. Linn. Whitlingham, Heigham.

„ FLAVOSTRIATUS. Don. Whitlingham, Heigham.

MACROPSIS LANIO. Linn. Common on oak, &c.

IDIOCERUS ADUSTUS. Schäff. } On willows, common.
„ LITURATUS. Fall. }

„ HEYDENII. Kirsch. I have taken several examples of both sexes of this rare species off Lombardy poplar at Cossey.

„ H-—ALBUM. Fieb. Common with the preceding, less so on *Populus nigra* at Trowse.

„ TREMULÆ. Estl. Curtis says, "I think I took this beautiful species in Norfolk." I have not yet been able to meet with it.

„ POPULI. Linn. Common on poplar.

BYTHOSCOPUS ALNI. Schr. Stoke Holy Cross, on alder.

„ FLAVICOLLIS. Linn. On birch, &c., very common and generally distributed.

PEDIOPSIS CEREUS. Germ. Local—Heigham on willow.

„ VIRESCENS. Fab. Willows; not very common.

„ NASSATUS. Germ. Ringland, Stoke.

„ SCUTELLATUS. Bob. Stoke, on alder.

„ TIBIALIS. Scott. By sweeping. The commonest of the genus in the Norwich district.

AGALLIA PUNCTICEPS. Germ. Common on low plants at Ringland in October.

„ VENOSA. Germ. Dunston Common, August.

TETTIGONIA VIRIDIS. Linn. "Very common:" Paget's 'Yarmouth,' Dunston, Ranworth, Postwick.

EUACANTHUS INTERRUPTUS. Linn. Scarce—Heigham.

EUACANTHUS ACUMINATUS. Fab. More frequent than the preceding. Postwick, Cossey.

ALEBRA ALBOSTRIELLA. Fall. Rather common—Ringland, Cossey, Swanton Morley.

CYBUS SMARAGDULUS. Fall. Common on willows.

CHLORITA VIRIDULA. Fall. Very common, especially by beating fir trees from November to March.

DICRANONEURA FLAVIPENNIS. Zett. Rare—one female in a damp shady place at Ringland.

TYPHLOCYBA JUCUNDA. Schäff. Rare—one specimen (female) on alder at Stoke, in August.

" DECEMPUNCTATA. Fall. Scarce—two examples by fir beating at Ringland in March, and one off sallow at Bixley in September.

" QUERCUS. Fab. Common on oak, &c.

" ULMI. Linn. Abundant on elm.

" TENERRIMA. Schäff. Common on almost every bramble bush.

" AUROVITTATA. Fieb. Rather common on oak bushes in hedges, Porland, Felthorpe.

" GEOMETRICA. Schr. In damp places on alders and willows, common but local, Heigham.

" GRATIOSA. Boh. Rare—one female off beech at Ringland.

" CRATÆGI. Doug. Scarce—Eaton, Stoke. On hazel in October.

" ROSÆ. Linn. Very abundant on roses, both wild and cultivated.

" DOUGLASI. Edwards. Rare—by beating fir in March and blackthorn in September, in two localities near Norwich. This interesting addition to our fauna is described in the 'Entomologist's Monthly Magazine,' vol. xiv, p. 248.

" ALNETI. Dahl. Heigham; not uncommon on alder.

" SCUTELLARIS. Schäff. Rare—Dunston Common, by sweeping. A very insignificant-looking insect, and extremely difficult to capture on account of its small size and excessively lively temperament.

" BLANDULA. Rossi. Common on various plants in the autumn.

TYPHLOCYBA TILIÆ. Geoff. Ringland, by fir-beating; very local. I have sufficiently demonstrated the distinctness of this from the preceding species in the 'Entomologist's Monthly Magazine,' vol. xiv, p. 132.

„ PARVULA. Boh. Rare—Eaton, Bramerton; on blackthorn.

EUPTERYX VITTATUS. Lin. Heigham; on low plants in damp places late in the autumn.

„ URTICÆ. Fab. Common on nettles.

„ PICTUS. Fab. Abundant on all kinds of plants in gardens, hedgerows, &c.

„ STACHYDEARUM. Hardy—Earlham, Ringland, Porland; common on *Stachys*.

„ PULCHELLUS. Fall. Ringland, Dunston, Stratton Strawless. The pale varieties are by far the most frequent, though I have examples equalling in depth of colour the specimen figured by Curtis.

GNATHODUS PUNCTATUS. Thun. Rare—Ringland; by fir-beating in March, two examples.

CICADULA SEXNOTATA. Fall. Common on various trees in summer.

„ VARIATA. Fall. Thorpe.

THAMNOTETTIX CROCEA. Schäff. Earlham, Felthorpe.

„ SPLENDIDULA. Fab. Beeston Park; Norwich, on ivy in September.

„ FRONTALIS. Schäff. Ringland, Dunston Common.

ATHYSANUS SORDIDUS. Zett. Arminghall.

„ OBSOLETUS. Kirsch. Earlham, Arminghall.

„ PLEBEIUS. Fall. Earlham.

„ SUBFUSCULUS. Fall. Ringland, Stratton Strawless.

„ DILUTIOR. Kirsch. Stratton Strawless.

„ PRASINUS. Fall. Stratton Strawless.

ALLYGUS MIXTUS. Fab. Dunston, Trowse; not uncommon on oak and poplar.

DELTOCEPHALUS ABDOMINALIS. Fab. Dunston Common.

„ ASSIMILIS. Fall. Cringleford.

„ PASCUELLUS. Fall. Thorpe; amongst short grass.

„ STRIATUS. Lin. Thorpe; amongst short grass.

„ OCELLARIS. Fall. Hellesdon.

DELTOCEPHALUS PULICARIUS. Fall. Stratton Strawless, Dunston, Cossey, Eaton; common in damp places.

ARYTŒNA ULICIS. Curt. Hellesdon, Eaton; on furze.

PSYLLA FORSTERI. Flor. Very abundant on alder.

„ ALNI. Lin. Stoke, Eaton, Cossey; not uncommon on alder.

„ SPARTIOPHILA. Forst. Hellesdon; on broom.

„ BUXI. Lin. On almost every box-tree.

„ SALICICOLA. Forst. Horsford, Heigham; on willow not common.

„ PINETI. Flor. On fir; Ringland, Sprowston.

„ COSTALIS. Flor. Bramerton, Arminghall, Stoke; on blackthorn, elm, and whitethorn.

„ CRATÆGICOLA. Forst. Common on whitethorn.

„ MALI. Forst. Stratton Strawless; common on crab-apple.

„ FRAXINICOLA. Forst. On osier, ash, oak, crab-apple, and whitethorn; Stratton Strawless, Stoke, Heigham, Swanton Morley. Apparently common everywhere.

„ FRAXINI. Lin. On young ash trees, common.

„ FERRUGINEA. Forst. Eaton; on blackthorn—rare.

„ COSTATOPUNCTATA. Forst. Rare—on blackthorn at Bramerton.

„ VISCI. Curt. This species, which was described by Curtis from specimens bred from mistletoe from Rougham, near Bury, I have taken on mistletoe at East Carlton. It does not seem to have been found elsewhere in this country.

TRIOZA URTICÆ. Linn. On willow, Porland; by fir-beating at Ringland; and on nettles everywhere.

„ HÆMATODES. Forst. Felthorpe, Ringland.

„ ALBIVENTRIS. Forst. Ringland, Stoke.

„ RHAMNI. Schrank. Ringland; by beating fir trees.

LIVIA JUNCORUM. Latr. By Filby Broad, &c., common: Pagets' 'Yarmouth.' Felthorpe Common; Cossey.

TRANSACTIONS

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Norfolk and Norwich

NATURALISTS' SOCIETY;

Presented to the Members for

1878–79.

VOL. II.—PART V.

Norwich:
PRINTED BY FLETCHER AND SON.
1879.

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Catalogue of Books in the Library of the Norfolk and Norwich Naturalists' Society.

ADAMS (Surgeon *Edward*). Notes on the Birds of Michalaski, Norton Sound. [Extract from 'The Ibis,' Fourth Series. Vol. ii., pp. 420—442.] 8vo.

BATH. Proceedings of the Bath Natural History and Antiquarian Field Club. Vol. iv., No. 1. 8vo. ... ... *Bath*, 1878

BELFAST. Eighth, Ninth, and Tenth Annual Reports of the Belfast Naturalists' Field Club for the years ending 31st March, 1871—73. 3 Nos. 8vo. ... .. *Belfast*, 1871—73

—— Annual Report and Proceedings of the Belfast Naturalists' Field Club, for the years ending 31st March, 1874—76. New Series, Vol. i., parts 1—3. 8vo. ... *Belfast*, 1875—76

—— Guide to Belfast and the adjacent Counties; by Members of the Belfast Naturalists' Field Club. 12mo. ... *Belfast*, 1874

BRISTOL. Proceedings of the Bristol Naturalists' Society, for the years 1869—72. 8vo. .. ... *Bristol*, 1870—73

—— Proceedings of the Bristol Naturalists' Society. New Series, Vol. i. and Vol. ii., parts 1 and 2. 8vo. *Bristol*, 1877—78

—— List of Officers and Council, Annual Report, List of Members, and Additions to the Library of the Bristol Naturalists' Society, for the years 1873—77. 8vo. *Bristol*, 1873—77

—— Laws of the Bristol Naturalists' Society, 1875. 8vo. *Bristol, n.d.*

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ADDRESS.

Read by the President, MR. F. W. HARMER, F.G.S., *to the Members of the Norfolk and Norwich Naturalists' Society at their Tenth Annual Meeting, held at the Norfolk and Norwich Museum, March 25th, 1879.*

LADIES AND GENTLEMEN—It is my painful duty to preface my address to you to-night by alluding to the loss we have this year sustained, in the death of one of the founders of this Society, the Rev. Joseph Crompton, M.A., who died in April last, in the 65th year of his age. He was chosen by the unanimous wish of our members to be our first President, not only as a tribute to his standing as a scientific man, but because of his enthusiastic love for the study of nature, and his generous sympathies with all engaged in scientific pursuits. More than thirty years ago we find him associated with Lindley, Sedgwick, and Brightwell, as lecturer at our Museum, in which institution he always took the warmest interest, as indeed he did in every effort for the furtherance of scientific investigation, or of scientific education. He was a man of broad views and of wide culture, and his loss will not easily be replaced.

We have also to deplore the decease of the Rev. J. Bates, M.A., which took place February 13th, 1879. His death is the more to be lamented, as he was but 50 years old, and still in the prime of life. His success at the University of Cambridge, where he graduated as 11th wrangler, gave promise of a distinguished career, nor was the promise unfulfilled. But, perhaps, he was most of all distinguished for his constant readiness to impart to others the varied stores of general and scientific information which in so large a measure he possessed. He had been repeatedly solicited to preside over our Society, and although his many engagements had hitherto prevented him, he would doubtless before long have

occupied this chair. We can only regret that his active and useful life has been so prematurely cut short.

In reviewing the proceedings of the past year, I am glad to find that we have had an increase of seven members, and that our funds are in a fairly satisfactory condition.

Among the papers submitted to us, and which our limited space enables us to print, I may perhaps call your attention to a memoir of one of our Norfolk worthies, Mr. Samuel Woodward, whose labours in the cause of science, together with those of other members of his family, have made the name they bear known and respected throughout the scientific world. When we consider Mr. Woodward's early disadvantages, and his untimely death, the amount of work which he accomplished, and the value of that work become the more remarkable. On the monument to his memory in St. Stephen's churchyard is inscribed, "Whatsoever thy hand findeth to do, do it with thy might;" and in these words we have probably the clue to his success. It is exceedingly appropriate that the interesting memoir which appears in our volume should have been contributed by his grandson.

Mr. Bridgman gives us another of his valuable additions to the Entomological Fauna of our county. Few but those engaged in scientific work can understand the amount of labour and time which the preparation of such a list involves.

Our invaluable Secretary, Mr. Southwell, has contributed a paper on "Norfolk Decoys," now well nigh things of the past, which subject he has handled in his usually interesting and exhaustive way.

At our June meeting, Mr. G. H. Asker favoured us with an interesting discourse on the Microphone, introducing a field of study upon which we had not before entered. I trust that this departure may be taken as a precedent for the future; for the broader the basis on which our Society rests, the more easy will it be to keep up the interest of our meetings.

We continue to publish the valuable Ornithological and Meteorological notes of Messrs. Stevenson and Quinton, which have so greatly added to the value of our Transactions in past years.

At our September meeting we had two papers, one from our friend Mr. S. B. J. Skertchly, and the other from Mr. Farn, in which those gentlemen dwelt on the fact, that there still exists in the neighbourhood of Brandon, now, some miles in a direct line from the sea coast, a small colony of maritime species, comprising seven moths, one beetle, one bird, and three plants. The presence of these Lepidoptera in the district had been previously alluded to by a former member of this Society, Mr. C. G. Barrett, in a paper read to us in November, 1870. Mr. Skertchly agrees with Mr. Barrett in considering that we have in these forms the remnants of the fauna and flora of the comparatively recent geological period when the basin of the fens was last occupied by the sea.

In October the present writer gave an account of a visit to the so-called crag deposits in the neighbourhood of Antwerp. We have this year added to the list of our honorary members, M. Ernest Vanden Broeck, of Brussels, who has presented us with a copy of his valuable work on the Pliocene deposits of Belgium, which is worthy of careful study. These interesting deposits, whose relation to the crag beds of our own district are so close, would well repay a visit on the part of the geological members of our Society.

Our renewed thanks are due to Miss Barnard, who has contributed so much to the interest of our meetings by the specimens she has so frequently sent us, as also to other ladies and gentlemen for similar assistance.

Three excursions have been made this year. A very enjoyable one to the lovely broads of South Walsham and Ranworth, by the kind permission of Mr. S. Gurney Buxton, on the 20th of June; a second to Martham and Hickling broads, on the 7th of July; and a third in August to Gunton. It has been suggested that an expedition for the purpose of dredging on the Norfolk coast, during the coming summer, would not only prove a pleasant change, but would give us an opportunity of investigating the natural history of our district, in a direction which has as yet received but little attention. I venture also to suggest, that an excursion somewhat more extended in its range than any we have

hitherto attempted, even perhaps to some adjacent part of the Continent, which should occupy at most but three or four days, would probably be as successful as it would be agreeable.

As Chairman of the Museum Committee this year, perhaps I may be pardoned for calling your attention to the unsatisfactory state of the financial position of that institution, as its interests are so closely connected with those of our own Society. Excluding one very generous gift of £20 per annum, which cannot be depended on *in perpetuo*, its income from subscriptions only amounts to about £200 a year, although it receives annually, and in addition to this, £50 for the rent of a room, which had it received the support it deserves, would long ago have been occupied by the Museum itself. It has often been said, that to serve any really useful purpose, a provincial Museum should be, as far as local objects are concerned, as nearly complete as possible, and typical as to those of general interest. To attain this end it is absolutely necessary that there should be a yearly sum at the disposal of the Committee for the purchase of new specimens; whereas our scanty income barely suffices to cover the ordinary expenses of maintenance.

Twelve months ago, when I last had the honour of addressing you, want of time prevented me from making more than a passing allusion to the fact, that to point to the imperfection of the geological record is regarded by believers in evolution a sufficient answer to those who demand the production of what are termed "missing links" between man and his supposed ancestors, as a condition of their acceptance of the theory of his derivative origin. It may be that the reason this reply is not looked on as satisfactory, is that those who reject it do not understand how excessively fragmentary is the evidence, bearing on the present controversy, which geology has as yet placed at our disposal.

I called your attention last year to the fact, that although man must have existed for long ages, and over wide areas in Europe, during Palæolithic times, of which we have abundant proof in the rude tools and weapons which are so frequently met with, we

have not hitherto discovered any undoubted skeletons of the fabricators of these implements. If the absence of such skeletons is not looked on as a serious objection in the way of our belief in Palæolithic man, the want of those of their supposed ancestors cannot be regarded as of greater moment. The fact is that the fossil remains of quadrumanous animals are of very infrequent occurrence, doubtless for a similar reason to that of the rarity of fossil human reliquiæ. The intelligence and agility of the monkey tribe generally, enable them to escape from such dangers as sudden floods or accidental drowning, to which the conservation of a large proportion of fossil mammalian remains is probably due. In Mr. A. R. Wallace's recent work on 'The Geographical Distribution of Animals,' he gives, as at present existing in the tropical region of the old world only, 13 genera and 109 species of Primates, excluding the Lemurs. Compared with this, it will be seen that our total knowledge of the former quadrumanous inhabitants of the world is of the most meagre character, when we remember that of the entire period, comprising certainly some millions of years, during which these animals have existed, we have discovered in the whole world, proofs of the existence of only about a dozen species altogether. Nor does this statement give anything like an adequate idea of the real facts of the case, for most of these species are known to us either from unique or fragmentary specimens. For example, there are in the British Museum five imperfect jaws of some monkeys from the extensive and rich Miocene deposits of the Sivalik hills of India. These five fragments, with a single astralagus, are as far as I have been able to ascertain, all that we at present possess of the skeletons of the innumerable animals of this order that have existed in India during the countless ages of the Tertiary epoch. In fact there is only one fossil monkey known to science, the *Mesopithecus Pentelici*, with the skeleton of which we have more than a fragmentary acquaintance.

The co-existence of the quadrumana with large numbers of carnivorous animals would formerly, as at present, have quickly removed all traces of their comparatively fragile skeletons. So speedily is this now effected, that Dr. Falconer says, in India,

where monkeys occupy in large societies mango groves around villages, the traces of casualties among them are so rarely seen, that the simple Hindoo believes that they bury their dead by night.

It is increasingly felt that our belief in the origin of primeval man must depend on the views that may be eventually accepted as to the genesis of species generally, and more light is thrown on this question by the study of the higher forms of life, as for example, that of the mammalia (to which I propose, in this address, to confine my remarks) than by that of lower organisms, because, as geology shows us, the former have been much less persistent and subject to change than the latter. For example, no living species of quadruped has been discovered as existing in Miocene times, while of the Miocene testacea a considerable per centage are absolutely identical with existing mollusks.

A few years since, the absence of any adequate number of connecting links between extinct and recent mammals, was repeatedly urged as a grave objection against the evolution theory; and the only reply that could then be given was, that the geological record was very imperfect, and had received but little thorough investigation. The progress of discovery has, however, of late years brought to light a vast quantity of fresh evidence, and this evidence is so distinctly in favour of evolution, that evolutionists need no longer adopt their former apologetic tone, but can now maintain that that which was formerly a difficulty in their way, is rapidly becoming one of the strongest supports of the theory.

It is nevertheless true, that geology can never furnish us with anything but the most imperfect collection of the remains of land-inhabiting animals. By far the greater part of the strata composing the accessible portion of the crust of the earth is of marine origin, much of it having been deposited at a distance from land; while of deposits representing old land surfaces, which may have been the home of the terrestrial mammalia, the geological record reveals to us next to nothing. The preservation of fossils is almost entirely due to their having become buried during the formation of

subaqueous deposits; but the comparative number of individuals whose remains became embedded even in such deposits as those which are formed at the bottom of fresh water lakes, or estuarine deltas, must always have been infinitesimally small. Were our knowledge of the present mammalia of Europe confined to information we could gain by dredging in existing lakes or estuaries, or by investigating the deltas of our present rivers, it would be very imperfect indeed; and it would be still more hopeless to search for modern mammalian remains in the North Sea or the English Channel. But when we remember that no sedimentary deposit has ever been formed except of materials which have been denuded from pre-existing formations, that the formation of one deposit must always be the exact equivalent of the destruction of another, and that consequently the present constituents of existing strata (excepting those directly derived from igneous rocks) have been arranged and re-arranged times without number, during the long ages which geology reveals to us, it will be obvious that the strata which now compose the earth's crust must be the merest fragment of the total thickness of sedimentary rocks which have formerly existed. And it is those deposits which are most likely to contain the remains of terrestrial quadrupeds which have been most exposed to the different denuding agencies.

Further, what a large proportion of the strata which have escaped destruction is inaccessible to us. The geological records are not carefully arranged like books in a well-ordered library, where we can put our hand at once on any volume we need. They may rather be compared to the mounds of Nineveh, which contain what the ravages of time have left to us of the historical records of Assyria; but these records are buried beneath the accumulated rubbish of centuries, and we are thankful if the chance discovery of a tablet happens to refer to the special subject in which we are interested.

Take the chalk, for example, with which we are more familiar than we are with deposits further from our county. It is often said that the Norfolk subsoil is chalk: most of our geological maps show

it to be so, and in a sense this is true, since the chalk underlies about 1700 square miles out of 2000, the approximate area of the county. At the same time, over by far the larger part of the district the chalk is covered by the Glacial and other Tertiary beds, often to a considerable thickness. Except over a narrow belt of land in the west of the county, and in the cliffs of Hunstanton and Weybourne, it is only met with along the sides of valleys; and I calculate that the area of bare chalk is less than one sixth of the whole superficial extent of this formation in Norfolk. Further, how very small a portion of the area which is thus accessible can ever become known to us. The average depth of the chalk in Norfolk is perhaps between 600 and 700 feet. Our excavations in it do not nearly average a twentieth portion of this thickness. Perhaps there are in our county, 2000 chalk quarries and pits of different sizes. Suppose that during the last few years, in which any interest has been taken in geological investigation, there have been excavated on the average 5000 cubic yards from each pit, we may calculate that the whole amount so brought under our notice is less than one hundred-thousandth part of the cubical contents of the Norfolk chalk. The proverbial search for a needle in a haystack is thus not more hopeless than is the likelihood of our stumbling upon any particular fossil, which may have been accidentally preserved to us, of the Cretaceous period. The chances are more than one hundred-thousand to one against us. The case of the chalk is by no means an extreme one, because, from its economical value, there are many more excavations in it in any given space, than is the case in other formations.

Then again consider that a very small part of the earth's surface has been systematically explored by geologists. The small area of the British Isles, and some other portions of the adjacent continent, are now becoming pretty well known; but the geological investigation of the vast continents of Asia, Africa, and even of America, has been, comparatively speaking, only just commenced. Those of us who are confined by the narrow boundaries of our own country, may well envy the good fortune of the members of the Geological

Surveys of the future, for whom such grand discoveries may in other countries be reserved.

It would be as unnecessary as impossible to enumerate all the considerations which have been or might be urged in illustration of the imperfection of the geological record; doubtless many of them are familiar to you. Perhaps, however, a rapid glance over the actual state of our collection of mammalian fossils, up to the time of those deposits, in studying which we find ourselves in the presence of forms which naturalists now, and with reason, regard as the ancestors of living animals, may be interesting, as shewing, not theoretically what geology might be expected to furnish, but actually what she has, up to the present time, given us.

We know that mammifers existed in Europe as far back as the time of the deposition of the Rhætic beds, which are considered by some geologists to belong to the Triassic, by others to the Liassic series. These deposits, which average about 50 feet in thickness, extend according to Mr. H. B. Woodward, from Redcar on the Yorkshire coast, to Lyme Regis in Dorsetshire. Mr. W. Boyd Dawkins has discovered in them a single molar of a small mammal, supposed to be marsupial *(Microlestes)*, of which genus Mr. Charles Moore had previously obtained, by searching through three cart-loads of clay, taken from a fissure in the mountain limestone at Frome, in Somersetshire, twenty-nine specimens of teeth. That this animal was not of local occurrence is proved by the fact that two similar teeth have been found in the neighbourhood of Stuttgart in Wurtemberg, more than 500 miles distant. All the information we possess as to the mammalian life of the Rhætic period is comprised in this handful of teeth.

Following the geological history, we may pass over the lower, middle, and upper Lias, representing an enormous period of time, and having a maximum thickness of something like 1500 feet, without finding any trace of mammalian remains. We may in like manner search unsuccessfully the greater part of the lower Oolitic strata, until at the base of the great Oolite, we reach the Stonesfield slate. Truth, it has been said, lies at the bottom of a well: our knowledge of the Stonesfield slate quadrupeds has been

gained by the accidental discovery of a few lower jaws at the bottom of a shaft, 62 feet in depth.* These minute fossils, ten only in number, have been referred to three genera; *Amphitherium*, *Phascolotherium*, and *Stereognathus;* and they are all the remains we at present possess of the mammalian life of Europe, during the long period represented by the lower Oolitic deposits.

From the middle Oolite no such remains have been discovered, nor have there been any from the Kimmeridge clay, nor the Portland beds, which have together a maximum thickness of 700 feet.

In the Purbeck beds, however, from an area 500 square yards in extent, and from a bed a few inches in thickness, have been taken what, compared with those I have mentioned before, seems a large collection. Although eight or nine genera, and fourteen species of quadrupeds have been described from these beds, the complete skeleton of none of them is known. The specimens are principally lower jaws, one, however, being a portion of a cranium. Sir Charles Lyell makes the following pertinent remarks on the discovery of these fossils:—† "But the most instructive lesson read to us by the Purbeck strata consists in this: they are all, with the exception of a few intercalated brackish and marine layers, of fresh-water origin; they are 160 feet in thickness, have been well searched by skilful collectors, and by the late Edward Forbes in particular, who studied them for months consecutively. They have been numbered, and the contents of each stratum recorded separately, by the officers of the Geological Survey of Great Britain. They have been divided into three distinct groups by Forbes, each characterized by the same genera of pulmoniferous mollusca and cyprides, these genera being represented in each group by different species; they have yielded insects of many orders, and the fruits of several plants; and, lastly, they contain 'dirt-beds,' or old terrestrial surfaces, and vegetable soils, at different levels, in some of which erect stumps and trunks of cycads and

* A fibula, and a humerus of a small mammal have recently been discovered in a slab of Stonesfield slate, which has been lying for many years in the British Museum.

† Lyell's *Elements of Geology*, p. 386.

conifers, with their roots still attached to them, are preserved. Yet, when the geologist inquires if any land animals, of a higher grade than reptiles, lived during any one of these three periods, the rocks are all silent, save one thin layer, a few inches in thickness, and this single page of the earth's history has suddenly revealed to us in a few weeks, the memorials of so many species of fossil mammalia, that they already out-number those of many a sub-division of the Tertiary series, and far surpass those of all the other Secondary rocks put together!"

Following the upper Oolitic series, we come to the Wealden beds, which according to Sir Charles Lyell are, in England, the remains of an ancient delta, but, in Mr. S. V. Wood, Jun.'s, opinion, the bed of a large fresh-water lake, which was contiguous to the sea. In these fresh-water deposits we might naturally expect to find the remains of mammalia, but no Wealden mammifer is at present known.

The middle and upper Neocomian strata are in like manner, as far as our present knowledge goes, non-mammaliferous, and so are the Cretaceous beds.

Although the remains of Secondary mammals are thus so few in number, there is no reason to suppose that mammalian life was of rare occurrence during the Mesozoic era. The ten specimens from the Stonesfield slate belong to four different species, while those from the Purbeck dirt-bed have been referred to fourteen, including insectivorous, carnivorous, and herbivorous forms. I am not aware that with the exception of the two minute teeth found at Stuttgart, and two lower jaws of a small mammal *(Dromatherium)* from the Triassic coal beds of North Carolina, in the United States,* any Secondary mammalian fossil has been found out of the British Isles. All the remains at present known to us of the mammals which may have existed over the whole world, previous to the commencement of the Eocene period, might be packed in a good-sized cigar box!

But the best illustration which geology affords of the imperfection

* Since the above was written, I have learned that the remains of a small marsupial *(Dryolestes priscus)* have been discovered by Professor Marsh, in the Jurassic rocks of the United States.

of the geological record is the fact that between the period of our own chalk and the Maestricht beds of Belgium on the one hand, and the lower Eocene beds, which in the South of England rest on the chalk on the other, there exists a gap which no deposit at present known in any part of the world in any satisfactory way bridges over.*

Sir Charles Lyell, comparing the fauna and flora of the Secondary and Tertiary deposits, says that the difference between them is as great as that between those of the lowest Eocene beds and our own times, but it might justly have been said in the present state of our knowledge that it is much greater; while Mr. S. V. Wood, Jun., in a little-known paper published in 1862,† insisted on the intervention of a vast lapse of time between the close of the Secondary and the commencement of the Tertiary periods, from the fact of the entire extinction during this interval of all the chambered cephalopodous molluscs, such as the ammonites, which in Cretaceous times had a world-wide range, and of such characteristic and abundant Secondary reptiles as the pterodactyles and the ichthyosaurs, and other enaliosaurian genera.

At the close of the Cretaceous period a continent was formed, which, in Mr. Wood's opinion, extended all over the geologically-known portion of the globe, and if the evolution theory be true, it was upon this post-Cretaceous continent, whose endurance was unquestionably so prolonged, that the ancestors of the abundant mammalia of the Tertiary period must have dwelt, but of any

* The thick lignite series of North America has been regarded as furnishing a passage between the Cretaceous and the Eocene, but according to Professor Marsh, it forms a well-defined horizon, terminating the Cretaceous series, as it contains the remains of those gigantic reptiles, with struthious affinities, called *Dinosaurs*, so characteristic of the Neocomian, or older Cretaceous formations, and of which no trace appears in the beds which overlie this series, and rest unconformably upon it; while in these latter, monkeys, carnivorous animals, and those more generalized types of the ungulata, from which, as evolutionists maintain, our present ungulate orders have descended, make their appearance in abundance.

† "On the form and distribution of land tracts during the Secondary and Tertiary periods."—*Phil. Mag.*, March, 1862, p. 161.

mammals which may have existed during this inter Secondary-Tertiary period, all trace is lost. The sedimentary strata of this interval of time, in which such remains might have been preserved, are wholly unknown. Even the fresh-water deposits which may then have accumulated have entirely disappeared.

At the commencement of the Tertiary era, however, the sea, in Europe, returned to a portion of the area which it had occupied during the Cretaceous period, and we have in addition to, and associated with the marine Eocene beds of Europe, fresh-water and estuarine deposits, from which have been obtained the remains of many quadrupeds. The tropical climate which obtained during this era, accompanied by its necessarily luxuriant vegetation, must have been singularly adapted to the existence and development of animal life. We know that in point of fact a numerous and varied mammalian fauna did exist, including representatives of most of our present families.

There are at present known, according to Mr. Wallace, in the Old World, not including the Australian region, about 240 genera, and more than 1400 species of land-inhabiting animals. Our acquaintance with the Eocene mammalia of the Old World is as yet obtained from a few localities in the South-East of England, in France, and in Switzerland only. We have no information whatever on this subject from the greater part of Europe, nor from the vast continents of Asia and Africa.

In striking contrast with the above figures, it may be remarked, that from the lower Eocene beds, which have in England a maximum thickness of 750 feet, and include different horizons of marine, estuarine, and fresh-water deposits, and which doubtless represent an immense period, we have obtained less than a score species of mammals; about the same number from the deposits of the middle Eocene, which have about the same maximum thickness in this country as the lower division; and even from the rich gypsum strata of Montmartre only about fifty different forms.

With reference to these latter deposits, which proved to Cuvier such a perfect mine of geological wealth, our imperfect acquaintance

even with such pages of the geological record as have escaped the destroying agencies of time is shown by the fact that very little has been added to our knowledge of these beds since the time of the great French naturalist; although the fossils he unearthed are doubtless but a fractional part of the whole number that have been preserved in the strata underlying the French capital.

It must not be forgotten, moreover, that many of the Eocene species are only known to us from unique or fragmentary specimens of teeth, or jaws, while of very few indeed has the whole skeleton been discovered. A well-known palæontologist once observed to me, when pointing out an unusually perfect specimen in one of our national natural history collections, "were such fossils common a good many of our so-called species would disappear."

It is the Miocene strata, however, which have of late years yielded the most important discoveries. The animals of the Eocene period seemed to Cuvier and the naturalists of his day sufficiently unlike existing genera or species to justify their belief that they were not connected by relationship with each other. In the Miocene beds have been discovered the remains of animals which clearly show that this apparent disconnection was merely due to imperfect knowledge. They are distinctly allied to Eocene mammals on the one hand, and to existing quadrupeds on the other.

During the past year, M. Gaudry, who, it may be remarked, was formerly an anti-evolutionist, but was converted by his own discoveries, has brought together the work of former writers and the knowledge gained by his own researches, and has given us a most valuable and interesting contribution to the literature of the subject in his volume, '*Les Enchainements du monde animal dans les temps Géologiques Mammifères Tertiaires.*' The locality which has yielded to this gentleman the most abundant collection of animals of the Miocene period, is that of Pikermi in Greece. So richly fossiliferous is it, that he says that he has carried away with him 1900 specimens of the bones and teeth of *Hipparion*, 700 of *Rhinoceros*, 500 of *Tragoceros*, and so on, having left behind a much larger number. The very profusion of specimens at this spot is in itself an illustration of the imperfection

of our knowledge, since the bed from which he obtained his collection is merely a fragment in a mountain gorge, 300 paces long and 60 paces in breadth, and of this he has been able to explore only a small portion. He reminds us that the region which was formerly the home of these vast herds of animals, which animals could only have existed in wide open plains, is now but an insignificant tract of mountainous country, 20 leagues by 10 in size; and this fact, which shows us what vast changes the physical configuration of Europe has recently undergone, will help us to understand why it is that so small a portion of former geological deposits is now left to us.

Passing to the Pliocene deposits, which geologically are so near to those of our own days, it is not difficult to find illustrations of the imperfection of our knowledge.

To take a case near home: the Coralline crag is a well-defined horizon of the Pliocene period; all that is left to us in Great Britain of what must formerly have covered a considerable area, is an isolated mass or two, occupying altogether about ten square miles of country. Some years ago, a trial pit was sunk at Sutton, near Ipswich, in the hope of finding coprolites. At the base of the Coralline crag, a phosphatic deposit was met with, containing half-a-dozen specimens of teeth,—of a mastodon, a rhinoceros, and a deer—with a few bones of cetaceans and sharks. Prof. Prestwich calls these fossils, from a geological point of view, a valuable collection, and this remark may show for what small discoveries geologists are thankful. The pit was only seen by Messrs. Prestwich and Ray Lankester; and a short time afterwards, not proving remunerative from a commercial point of view, it was filled in and levelled. There are no other remains of terrestrial mammals known to us from any bed of the age of the Coralline crag in Northern Europe.

The so-called Forest bed of the Norfolk coast is similarly an exemplification of the fragmentary character of the geological record. The specimens of the well-known Gunn collection in our Museum are obtained from a bed at the base of the cliffs of Norfolk and Suffolk. We have no inland section whatever of this

deposit, which is only exposed in places along the coast. It is not probable indeed that it extends far inland. It is very rarely exposed, in consequence of its position at the base of the cliff, being usually covered by the beach. Had it been 20 feet lower than it is, we might never have known of its existence; and as the sea is continually wearing back our coast line, the time will come when all traces of this interesting deposit will have been destroyed. Seeing that the Forest bed (so-called) is such a mere fragment, it need not surprise us to find that among the fossils in our own Museum from this bed, some are unique. All that we know of *Cervus Sedgwickii* (*fide* Mr. Gunn) are the fragmentary antlers in his collection; there is also in our Museum, an interesting though imperfect specimen of the horn of an animal, which Mr. Gunn has named *Cervus bovoides*, because he considers it to combine cervine and bovine affinities, which is altogether unlike anything which has been elsewhere discovered.

Although our knowledge of the past life history of the globe is thus, and must always be, so imperfect, recent additions to that knowledge are so important as to justify us in the belief that we shall before long be in possession of, if we do not already possess it, an overwhelming amount of evidence that there has been no break in the history of the organic, any more than of the inorganic world; that those principles of continuity which have been firmly established, so far as the crust of the earth is concerned, showing that the present state of things is merely the continuation of the past, will be speedily accepted as unquestionably true of the former life history of the globe; that palæontology and zoology bear the same relation to one another as do geology and physical geography.

If it be true that existing animals are descended from those of which palæontology teaches, we ought to find, as we trace the geological history backward, that the lines of life converge, just as in a genealogical tree we find the degrees of consanguinity of the members of the different pedigrees become closer as we approach the individual from whom all branches of the family have sprung; and it is precisely this which the geological history reveals to us.

It has been long known that the earlier Tertiary strata furnish us with forms that partake of the character of groups which are now widely separated. M. Gaudry, however, in the volume I have before mentioned, gives us a great many illustrations of the way in which recent mammals, now distinct, are united by fossil forms. I believe that the importance and number of these facts is not so widely known as it ought to be, and I will therefore venture to instance a few examples, although the value and weight of the evidence can only be appreciated by those who will take the trouble to examine it in detail.

One of the principal divisions of the mammalia is that between placental and implacental animals. Two forms, of which only the jaws are known, *Pterodon* and *Hyænodon*, have been found in the Eocene and lower Miocene of France. Some eminent naturalists, have ranked these animals, from their dentition, among the carnivora, while others equally qualified to judge, believe them, from certain characteristics which connect them with marsupials, to have been implacental animals, and this is exceedingly important, as connecting the secondary mammals, with their strongly marked implacental affinities, with those more highly developed forms which have, except in Australia and South America, now supplanted them.

The connection which the study of extinct forms has established between pachyderms and ruminants, which were formerly regarded as quite distinct, has been such as to necessitate the reconstruction of the whole classification. M. Gaudry says, that the difficulty does not consist in knowing how ancient pachyderms became ruminants, so much as in deciding which species of the former have the best title to be considered the ancestors of the latter. Even the classification of the mammalia which has been more recently adopted, that of the perissodactyla, or odd, and the artiodactyla, or even-toed animals, is not easy to insist on in the presence of fossil forms. The teeth of the ancient paridigitate *Anoplotherium* and the imparidigitate *Palæotherium* resemble each other so nearly, that it is difficult to distinguish isolated molars of these two animals.

Among the proboscidians may be cited the case of a fossil pachyderm, which so partakes of the characters of the mastodon

and the elephant, that its discoverer gave it the name of *Mastodon elephantoïdes*, while Dr. Falconer called it *Elephas Cliftii*. M. Gaudry gives a number of interesting facts showing the difficulty of drawing the line between mastodons and elephants, which genera, were they only known to us from British species, we should certainly regard as perfectly distinct.

The Insectivora are now divided into three families, the hedgehogs, the moles, and the shrews. The remains of an animal have been found in the French Miocene, which one authority calls *Erinaceus soricinoïdes*, from its resemblance to the hedgehogs; another who regards it as nearer to the shrews, names it *Plesiosorex soricinoïdes;* and a third *Plesiosorex talpoïdes*, from its affinities with the moles.

Among the carnivora may be noticed the *Amphicyon* of the middle Tertiary deposits, which as its name denotes belongs to the *canidæ*, but which was a plantigrade animal, and has other points of resemblance with the bears, thus connecting forms now widely separated. Similarly the *Cynodon* unites in itself the characters of the dogs, and the civets, and the *Ichtitherium* those of the civets, and the hyænas. M. Filhol says of the *Cynodon*, that it is so exceedingly variable that seventeen species might be described from the specimens which have been discovered; some of them incline towards the dog, and others towards the cat.

Among the quadrumanous animals, the only one of which the complete skeleton is known, the *Mesopithecus*, is decidedly an intermediate form, having the skull of a *Semnopithecus*, and the bones of a *Macacus*.

It is not thus occasionally that we meet, in searching through the museum of nature, with a few isolated cases which may be brought forward as showing the closer relationship of the mammalia in geological times. The rule is, as Mr. Darwin long ago pointed out, that the ancient forms were more generalized, while modern ones are more specialized.

But facts have recently so accumulated that we can take one step further. We can not only show that the various forms of animal life, extinct and recent, fit into their places in one great

plan of relationship; we can point to intermediate links which distinctly connect modern with ancient animals.

The pedigree of the horse, which Prof. Huxley has alluded to in his 'American Addresses,' as proved by the recent discoveries of Prof. Marsh, is familiar to many of you. Prof. Marsh states, that he has himself unearthed with his own hands, not less than thirty distinct species of the horse tribe, in the Tertiary deposits of the Western States of America alone. He has by means of these fossils traced the pedigree of our existing horses from a diminutive animal of the lower Eocene, *Eohippus*, which was about the size of a fox, had the bones of the fore and hind leg distinct, and had four toes and a rudiment on the fore feet, and three toes behind. This animal was succeeded in time by the *Orohippus*, which was slightly more equine in its structure than *Eohippus*. In the lower Miocene beds has been found *Mesohippus*, about the size of a sheep, with only three toes and a splint on the fore feet, and having the bones of the leg no longer distinct. *Mesohippus* was followed by the upper Miocene *Miohippus*, a somewhat larger animal; and in the lower Pliocene by the *Protohippus*, of the size of the ass, which had one toe reaching to the ground, and two shorter digits, one on each side of the leg. In the *Pliohippus* we have these short digits becoming mere rudimentary splints, as in existing horses. Prof. Marsh says, that there has been a corresponding transition in the character of the skeleton, skull, teeth, and brain, between *Eohippus* and *Equus*. Prof. Huxley claims these facts as an unmistakable piece of historical evidence, and I think few unprejudiced minds will disagree with him, for we must not fail to observe that these modifications of structure correspond with the relative appearance in time of the animals whose remains are thus found in succeeding geological formations. It is not, of course, maintained that we have the exact pedigree of the horse, but that we have facts to show how in course of ages the equine type became modified from its former to its present condition. A similar line of collateral relationship was traced by Prof. Huxley in 1870, showing the connection of the horse tribe with the *Hipparion*, the *Anchitherium* and the *Plagiophilus*.

The case of the *Hipparion* is an instructive one. The bones of this animal differ so widely that M. Gaudry says, it is difficult at first to refer them to one species; but an examination of a large number of specimens renders it as difficult to draw the line which should separate them. There are two distinct races of *Hipparion*, one light and the other heavy, but they do not differ more, *inter se*, than do the different breeds of our domestic horse, of which, were only a few fossil specimens known, a number of good species could no doubt be made.

M. Gaudry says, with reference to the deposits he has himself investigated, that where they are of no great thickness, representing a comparatively short period of time, he does not find in the mammalian fossils they contain, evidence of change of character; but where the contrary is the case, as in some phosphate beds at Quercy, which, he says, represent a succession of geological periods, he has found forms which have very different degrees of development.

It has long been known that the *Rhinoceros* connects itself through the *Acerotherium*, which is a rhinoceros without a horn, with the *Palæotherium* of the Eocene. M. Gaudry's researches have enabled him to show further how the different existing species of *Rhinoceros* can be traced back through different fossil forms till they meet in *Acerotherium* and *Palæotherium*. He has also been able in like manner to construct genealogical tables, one of which shows a similar connection between the three different existing types of *Hyæna*, through various Pleistocene forms, with the Miocene animals, *Hyænictis* and *Ichtitherium*; and others, the mutual relationship which recent and fossil Elephants, recent and fossil Horses, and recent and fossil Pigs, bear to one another.

Among the ruminants, he alludes to the fact that the earliest known forms, such as the *Xiphodon* from the Eocene, and the *Dremotherium* from the lower Miocene, were hornless; that horned ruminants did not make their appearance until the middle Miocene, and that the earliest antelopes of the period had very small horns. The antelopes of the upper Miocene, on the contrary, had larger horns *(des cornes considérables)*. He points out that just as the antlers of the existing red deer, *Cervus Elaphus*, increase in number

and size with the age of the animal, so during the history of the Tertiary deer has there been a similar development, from the lower Miocene forms, whose horns were without antlers, to those of the middle and upper Miocene, when they became more complex, until their greatest development is reached in the *Cervus Sedgwickii* of the Cromer beds.

Prof. Boyd Dawkins shows that a similar development of horns took place among the *Bovidæ*. In the Italian Pliocene there were hornless oxen, while the Pleistocene bisons and *Uri* were distinguished by the size of their horns. He suggests that the polled cattle produced by domestication, which modification was effected by careful selection in about 50 years, furnish us with an interesting example of a reversion to an ancestral type.

The immense collection of mammalian remains which have recently been collected by Professor Marsh from the American Tertiary deposits of the Rocky Mountains, and which it is said will take a life time completely to investigate and describe, are likely to afford far more important evidence in favour of the derivative hypothesis even than that which European palæontology has given us. Sufficient has been already gathered from these fossils to show that the pedigree of the horse is by no means an isolated one, but as I have already so largely trespassed on your patience, I can only refer you to an address delivered by Professor Marsh to the American Association for the advancement of Science, in 1877, on the "Introduction and Succession of Vertebrate Life in America," a summary of which appeared in 'Nature,' vol. xvi., p. 448, which will well repay careful study. One interesting fact I may perhaps quote. Professor Marsh says that all the earliest known Tertiary mammals had very small brains, in some cases approaching in size and form to that of reptiles. There was a gradual increase in size of this organ during the Tertiary era, especially in the cerebral hemispheres, or higher portion of the brain, which has also become in some groups more convoluted, and thus increased in quality as well as in quantity.

When we reach the Pliocene period, we find ourselves among mammalian forms which are so closely related to living animals, that they assuredly offer no obstacle in the way of our belief in the

evolution theory. With a few exceptions they are referable to existing genera, but there is that somewhat greater divergence from recent forms than we find among the later mammalia of the Pleistocene period, which we ought to find if evolution be true. For example, *Ursus arvernensis* from the Forest bed, is further removed from existing bears, than is the later form *Ursus spelæus* of our caverns. In the same way the characteristic *Elephas meridionalis* of the Cromer coast, decidedly approaches nearer to the older form mastodon, than does the mammoth, *Elephas primigenius*, which was the contemporary of primeval man in Britain.

The Pleistocene animals, with a very few exceptions, differ but little from existing forms, perhaps not more than do the different breeds of our domestic animals from each other. But there is just that difference between fossil and recent animals as to cause palæontologists to disagree, as in the case of the cave lion or the cave bear, whether the former are identical or not with existing species. No new wild animal has been introduced into Europe, Professor Dawkins tells us, since the Pleistocene period, except perhaps the common rat and the elk; but on the other hand we have the appearance of the domestic animals, such as the swine, dog, sheep, goat, horse, and ox, and some of the various breeds of these, as I have before remarked, differ quite as much, *inter se*, as do the forms known to us from geological specimens, which naturalists deem worthy of specific distinction. Mr. Darwin says, that the dogs of Queen Elizabeth's time would present the appearance of different species, compared with those with which we are familiar.

If we add to all this,—and facts such as those I have mentioned might be adduced to almost any extent,—that the present geographical distribution of mammals can not only be without any difficulty made to fit in with the different faunas which in later Tertiary times inhabited different portions of the earth's surface,*

* In the *Nineteenth Century* for December last, there appeared an article by Dr. Sclater, giving some facts in geographical distribution which appeared to him to be inconsistent with evolution; but Mr. Wallace's reply, two months later, gives us an instructive example of the way in which such apparent difficulties disappear in the light of fuller knowledge of the subject.

but in many respects affords the most unmistakable evidence of the relationship between these fossil and recent faunas, as for example, the fact that with one or two exceptions, the extinct as well as the existing animals of Australasia are marsupial, we have I think an amount of evidence before us which it is almost impossible to resist. It is quite true, as I originally insisted, that we are reasoning upon a very imperfect amount of evidence, but every fresh palæontological discovery has invariably gone in the direction of supplying fresh arguments in favour of the theory of derivation; and I have little fear therefore, that future evidence will do anything to reverse the unmistakable bearing of present facts.

The controversy between evolution and its opponents, is, I think, strictly parallel to that carried on, some years ago, between the early geologists and their adversaries. Our forefathers found it impossible to believe that the natural causes which could be observed in daily operation, were sufficient to bring about the stupendous changes in the configuration of the earth which geology professed to have accounted for. At first they denied that such changes had taken place, replying to facts like the occurrence of marine shells in strata far above the sea-level, that they were so created.

We can imagine one of the early anti-geologists, when he was asked to believe that the summit of a mountain range, some thousands of feet in height, was composed of materials which had originally been deposited as sediment at the bottom of the ocean, but which had been elevated by the continuous operation of causes of no greater intensity than those which are now at work, or to whom it was pointed out the ravine in which he might be standing had been excavated by the comparatively insignificant mountain torrent at his feet—we can imagine him objecting, that while there was a sufficient amount of change going on to give a colorable appearance to the theory, that the supposed causes were altogether incommensurate with the alleged results. Or, we may suppose his attention being called to one of the fiords in Norway, where successive deposits of sand containing sea-shells could be seen at different elevations, marking the sides of the surrounding hills. In

reply to this evidence that the land had been gradually rising, he might well have argued that had such been the case, there must have been a continuous deposit of beach material, from the existing sea-level to the highest point at which the shells and sand could be observed, whereas the presumed beaches were now seen to be wholly unconnected with each other. Urging that nothing but demonstrative evidence would ever convince him of the truth of that which was, without such proof, merely an hypothesis, and remarking, "*hypotheses non fingo*," he would probably have gone on to say, "I cling to the time-honoured belief of my ancestors, that the world was created as we find it."

It seems to me that the present position of the anti-evolutionist is precisely similar to this. He is willing to admit that the organic world is subject to change—that small differences have arisen among living forms, which naturalists call varieties—but he will not believe anything of which he cannot have ocular proof. He is not satisfied with such connecting links as those to which I have called your attention, any more than we may suppose the anti-geologists were with the fragments of the ancient beach deposits along the shores of the Norway fiords. Although the evolution hypothesis is supported by an enormous and concurrent mass of evidence, which not only affords a simple and rational explanation of the facts of zoology up to any particular date, but equally accords with, and as a rule, receives new strength from, fresh discoveries as they come to light; although the alternative hypothesis is one for which no evidence ever has been, or ever can be offered, he is not convinced. Under such circumstances, the advocates of evolution may well be content to bide their time. As assuredly as the opposition to geology collapsed and died out, because there was no real force in the arguments by which it was carried on, which were merely of the nature of trivial objections, so will, I have little doubt, and for a similar reason, the opposition to the hypothesis we have been this night considering.

And it seems to me that, looking through the current literature of the day, except from one quarter, active opposition to it has almost ceased already. I say from one quarter, for had it not been

for its supposed antagonism to religious teaching, I believe the controversy would have been by this time well nigh forgotten; and even in this direction we are not without signs of coming change. Is it too much to hope that the controversy between theology and Darwinism may be the closing episode in the long-continued and fratricidal warfare between religion and science? It has recently been said that the future does not belong to that theology which conducts a fruitless battle against the victorious doctrine of evolution, but to that which takes possession of, recognises, and uses it. Is it too much to hope, that finding it lawful to learn even from one she has considered an enemy, theology may discover that in the great doctrine of evolution, she has a principle which, recognised as the *modus operandi* of the Creator, is able to exercise as powerful an influence for good, and to throw as much light on her own field of study, as it has done on that of the physical universe, or as the discovery of the law of gravitation formerly did for physical astronomy.

One is tempted to inquire why there should not be strife between the different branches of knowledge, similar to that which has so long been carried on between religion and science; the reply is, that there is a recognised brotherhood among the former, so that the facts ascertained by one are the property of all. So long as theology, standing aloof in haughty isolation, using the very name of rationalist as a term of reproach, prefers rather to appeal to authority, so long will the never-ending, ever-shifting conflict go on; but the time is surely not far distant when, admitting that faith which does not ultimately rest on reason is mere credulity, she will be content to take her place among the inductive sciences. Such a theology would be, I take it, the very summit of the great pyramid of knowledge; the part for which all the rest existed, to which all the lines of the structure pointed: for want of such the whole pile is as yet, as it seems to me, misshapen and incomplete.

A little child whose home is in a mountain valley, beyond which his thoughts even have never wandered, believes that the stream which flows past the door of his father's cottage originates from the mountain, a rocky spur from which, projecting into the valley,

shuts in the prospect, and seems to render exit from the hamlet in that direction impossible. The child as little dreams of the long winding course which the stream has traversed since it left the mountain tarn, from which, many miles away, it first issued, as he imagines the grandeur to which the river will attain, or the leagues it will traverse, ere it reaches its goal.

The child's ideas of the universe are bounded by the limits of his vision in his mountain home; and all his conceptions, subjective and objective, are influenced by the narrowness of his horizon. As he grows in years, however, he begins to climb the mountain side, and as he does so, his outlook gradually widens, revealing the existence of a new and larger world. From his new point of vantage he catches glimpses of what seems another valley, with the waters of another stream dancing in the sunlight. The vision is startling, and the child does not at first suppose that the stream he now for the first time sees, has any connection with the one with which he has been so familiar; but as he climbs higher, the vista opens out, and the whole course of the valley is mapped out below, and the truth of its continuity breaks upon him, as he sees the little silver thread appearing and re-appearing, until he loses it in the hazy distance, which his sight cannot penetrate.

As time goes on, he will track the stream to its source, and will learn to understand the laws, by the operation of which it has been called into being; and in the other direction he will trace its progress, finding that it ceases its comparatively useless existence, and fertilizes the plain through which it flows, in its more tranquil course.

The child's theory of the universe has to be largely modified by the new facts which he has apprehended; but many things become plain to him which were before mysterious: and who shall say that the child's first knowledge—his first faith, were the best, or who shall say that his apprehension of moral or religious truth will be injured by his wider grasp of the facts of his surrounding?

It is undoubtedly true that the views I have been endeavoring to establish will necessitate a far more serious reconsideration of current theological theories than has any set of facts which

science has in past times brought to light; but if they be true, and there is far too much evidence in their favour for them to be disregarded or put on one side, the sooner they are courageously faced, and worked out to their logical issues, the better it will be for the interests of religion, which all good men must have at heart. And I cannot but believe that the outlook of modern science, which in the one direction enables us to trace the stream of human existence so far back into the past, and in the other gives us the promise of its more tranquil and beneficent course for the future, will eventually seem to be as far above the narrow views which have hitherto prevailed, as the knowledge of the man exceeds that of the child; and that thus the doctrine of the antiquity and derivative origin of man will be no exception to the rule, that the discoveries of science, however startling they may at first have appeared, have invariably revealed to mankind a grander as well as a juster appreciation of the universe and of its Almighty Creator.

I.

THE GANNET CITY.

By J. H. Gurney, Jun., F.Z.S.

Read May 28th, 1878.

In the month of March, 1876, I paid a visit to the great Gannet * City, called the Bass Rock, on the southern entrance of the Firth of Forth. I made visits at the same time to Flamborough Head, and the Ferne Islands, accounts of which have been published in Mr. Dawson Rowley's 'Ornithological Miscellany,' and in the 'Proceedings of the Natural History Society of Glasgow.' I now wish to lay before the Norfolk and Norwich Naturalists' Society an account of the birds which live on the Bass Rock in the summer; but to do justice to the old Rock, I must also be allowed to refer to the historical associations which connect it with the lives of the Scotch martyrs.

On getting to the Drem station, which is the junction for North Berwick, a very high pyramidal hill, carpeted with green, is perceived, called North Berwick Law, this the tourist, unless forewarned, will mistake for the Bass, which is indeed a lower rock and further off. Arrived at the Bass itself, he will have no little difficulty, if there is a swell on, in effecting a landing, and this done, he cannot get any further unless he has come provided with the key of the castle wall. On the day of my visit the sea was all one glassy lake, not a breath of wind played upon its surface, no wavelets broke against our bows, scarce a ripple was seen, nature was stilled into repose; and before us huge and gloomy, there slept upon the waters a mass of homogeneous trap older than the Pyramids, taller than St. Paul's, and mightier than the fierce elements, and that huge mass was the Bass. Far and near the puffins and guillemots could be seen like black dots upon the

* It seems hardly necessary to premise, that Gannet *Sula bassana* (L.) and Solan Goose are names used indifferently for the same bird.

water, luxuriating in the glorious change to fine weather. Some of a provident turn of mind, were evidently making sure of a good fish dinner while the fine weather lasted to them; others floated listlessly in the warm sun, or scanned our approaching boat with a lazy curiosity; a few stood up and flapped their wings rapidly for a few seconds, then turned themselves over in the water, and in their play the whole of their identity was quickly hidden, and the black part of their plumage lost in a breast of white, which gleamed in the sun's dancing light. Gently we glided up to the landing-place, so steep, so cramped and narrow, that one man could defend it against a host, though they carried with them St. Baldred himself, whose sainted body was found in three places at once.

> "While one by one, three corpses lay,
> Like twin brothers transformed to clay."

That old anchorite was about the first man who lived on the Bass Rock.

But the members of our Society will be interested in hearing about the various naturalists who have been there. Let us fancy ourselves standing on the narrow platform, which I have described, on the 19th of August, 1661. We might have seen an interesting sight—the Rev. John Ray, whose name is a household word to naturalists, and his pupil, or more properly his companion, Francis Willughby, step ashore, athirst for new material for that great book upon ornithology, which the latter was never destined to see published. These men had made a journey very similar to that which I was making, and in my humble way I felt a pride in following the footsteps of the great naturalists. It must have been something more than a coincidence which led Macgillivray and Audubon* there, on the same day of the same month in 1835. What a link of sympathy united the two friends, one a Scotchman and one an American. "One touch of nature makes the whole world kin," says Shakespeare, and if they did not feel it, there is no such thing as a bond of friendship. As naturalists it is these to whom our thoughts turn, but how

* Among various other naturalists of note who have at different times visited the Bass, may be mentioned William Bullock and Arthur Strickland, in 1807.

different has been the *métier* of some who have disembarked at the Bass.

Monks and martyrs, divines and jailers, have each in turn trod that way which led them into exile. The names of Jacobites and Lauders—a long roll—are written in its annals of blood. From here James I. took sail before his long captivity. Here was the state prison of Charles II., who purchased this island of the Lauder family. Here, after the revolution of 1688, a desperate body of men settled, and having a large boat which they hoisted up on the rock or let down at pleasure, committed many acts of piracy. Here, to this day, may you see the cruel dungeon where Gillespie, Fraser, Scott, M'Gilligen, John Blackadder, and many others of the salt of the earth, wasted the best of their lives—a grey remnant of a cruel reign, which time, and weather, and salt spray, cannot efface. As I strolled into the unwholesome cell, I wondered how these Scotch divines—how human beings at all—could have survived in such a place. Small wonder if after lying there four years the wretched Blackadder's health became so much impaired as to excite apprehensions for his life.* The taint of the dungeon clings to its walls, and in listening to my guide's category of old coins and curiosities—some of them most valuable—which have been found near there, it seemed as if it were a tale of blood-money; money for which those old Scotch covenanters had been betrayed and seized, or the offerings of a treasured ransom which never bought the freedom it was hoarded for. Beyond the dungeon is a deserted fortalice, not yet undermined by rabbits, and beyond that a garden and a well. The gardener who planted the garden has gone to his rest long ago; but his yellow tulips† are still there, blossoming in fragrant memory of him by whom they

* He was set free by order of the Privy Council, December, 1685; but the pardon came too late. Before it could be carried into effect death released him. In the churchyard at North Berwick, where he was buried, I saw a curious inscription to him, beginning:—

"Blest John, for Jesus' sake, in Patmos bound,
His prison Bethel, Patmos Pisgah found;"

and reaching to the length of twenty-three lines, which I have no doubt is cotemporary with the date of his death.

† Specimens of the large Tree Mallow (*Lavatera arborea*, L.) which grows on the rock, may be seen at Mr. Kendall's, at Canty Bay.

were sown and watered. The well, at which in days of yore strangers came and drank, still yields its small supply of water. Both link themselves with the past, when Ray wrote:—"They make strangers that come to visit it burgesses of the Basse, by giving them to drink of the water of the well, which springs near the top of the rock, and a flower out of the garden thereby" ('Itineraries' p. 155). And this is all until the climber finds the apex of his steep ascent in the cairn-crowned summit, and views the scene around him. To the north, coal-ships and coasters ply to and from Leith,—to the south is distant St. Abb's Head, to the east the German Ocean, to the west North Berwick Law, and old Tantallon castle, from whose grated portal bold Marmion spurred his steed, as the portcullis descended at grim Douglas' word.

> "The ponderous gate behind him rung:
> To pass there was such scanty room,
> The bars, descending, razed his plume."

According to the lowest, and at the same time most reliable estimate, the Bass is 313 feet high. It is a species of clinkstone trap. It is the property of Sir Hew Dalrymple, and is now let for the comparatively small sum of £20 a year* to Mr. Kendall, of Canty Bay, who keeps the key, and supplies boats at a reasonable charge. He takes perhaps 1000 young Solan Geese in a year, which he dispatches to Sheffield and many other towns. He has five or six women in the season at work plucking, at 1s. 6d. a day each. The feathers are good for making beds. Some of the geese are cooked before they are sent off, and I was shown an oven in which four at a time could be done. The eggs are also thought palatable by some persons, and I hear a large order comes annually from an hotel in the London Haymarket. But there are other sources of profit besides the gannets. Rabbits are plentiful, and I am sorry for it, as they undermine the ruins, and interfere with the puffins, besides which they are accused of eating up the sea-beat which in Ray's time grew in plenty ('Itineraries,' p. 156). The guano-grown grass affords capital pasturage for a score or so of sheep. Bass mutton has a great name in Scotch markets, though certain

* This is doubtless exclusive of the pasturage, which is estimated at seven acres.

writers—no doubt self-interested—insinuate that very much of what is sold as Bass mutton never saw the Bass, but this is resented by the honourable guild of butchers as a libel on their veracity!

But that which I have to do with, is the City of the Solan Geese, the great spectacle for which this rock is above all others famous, save its twin and counterpart the Craig of Ailsa.* From time immemorial these birds have nestled by thousands, I might almost say by tens of thousands, upon the Bass Rock. You may look down those precipices, and far below you, see, as it were a falling snowstorm. The flakes of white are the Solan Geese, which disturbed by the apparition of a head between them and the sky, launch out into 300 feet of space; and in a ceaseless maze which the eye cannot follow, circle down and up, and up and down again. In a few minutes your head swims, and with aching brain you try as best you may to get back into *the open air*,—anywhere, out of the labyrinth of geese.

> "The air was dirkit with the fowlis,
> That cam with yammeris and with yowlis,
> With shrykking, screeking, skrymming, scowlis,
> And meikle noyis and showtes."

Thus sings William Dunbar, who died about 1580, and his verses are very applicable to the sight which anyone will see who goes to the Bass Rock in summer. It is amusing to observe the expression of dignified resentment which the geese wear in turn, as they quit their nests. Each one will give a few perpendicular wags of the tail as it flies away—a sort of protest against being turned out. For a considerable time they sail about, but soon tranquillity reigns again in the community, and they return to their stations as they left them, one by one. Happily it is an anger which is short-lived. In fifteen minutes from the time I put them off, some of them had forgotten the cause, and were again on the rock quarrelling among themselves, quite regardless of my presence only a few feet off. Now was the time to see them in undisturbed enjoyment of their home, and to watch their habits. It was not long before I saw an entertaining

* I visited this station on the 5th of October, 1867, at which date some of the young gannets were still in the down.

scene. Two old gannets perched on the rock beside each other and near me. Two human beings could not have greeted one another in a more friendly and sociable way, they exchanged kisses by touching beaks, they sat down together, and for some minutes were as amicable as possible. But, unfortunately, one of them espied a large piece of seaweed. Ah! fatal find! It is the brand of discord. No longer are they a happy pair. There is no more kissing, but in lieu of that one tweaks the other's beak with such force as he is capable of; all their fury is aroused, and now they bristle like a pair of gladiators. Each one looks, as he takes hold of an end of the disputed piece of seaweed, as if he meant it to be no tournament but a mortal conflict. They lug, they tug, they strain their sinewy muscles. For some moments neither seems to get a decided advantage, but finally the stronger of the two drags off the seaweed. It *was* astonishing what a little thing would provoke a fight. The arrival of a fresh comer was a sure signal for a combat, for sometimes it would be necessary to secure a seat for himself by pushing some brother gannet off. Instantly war is declared, and the two are at it tooth and nail. The arena is small, and the fight is often hard. They are sure to get too near the brink, and in a twinkling they are dashed over the precipice. It is too late for them to part now—they are locked in an unfriendly embrace from which neither can extricate himself, until with a resounding splash they hit the water. But these tough gannets are used of old to high descent, and are none the worse for their fall. In the water they are very bulldogs for not letting go. I saw one take another by the beak and spin him round, until the white foam frothed and bubbled, and the surge was lashed on high, by their pinions. I watched this pair frantically spinning round and round, like an everlasting top, in their mighty tussle, for a long time, until I got tired of looking any longer, and lying back on the grass, I resigned myself to my meditations and a pipe.* Had I remembered them, I might have appropriately

* I was much amused to learn that the pipe I was smoking was made of a gannet's bone. The lessee has had frequent applications from tobacconists to supply them, which he has done, at the rate of three a penny. They are the lesser wing-bone, and are made into stems, and with a bit of cork at one end are retailed at threepence each.

writers—no doubt self-interested ... are told that:
what is sold as Bass mutton nev
by the honourable guild of b

But that which I have
Geese, the great spectacle
famous, save its twin
From time immemoria
might almost say by t
may look down thos
falling snowstorm
which disturbed
sky, launch out
which the ey
down again.
brain you t
anywhere,

...y enough to be the first
...en a soul on the rocks for
... not yet began to lay, were
...ly surprised that there was
...ed that his birds were later
...plement, but he had once seen
...ird reared juvenile gannets out
... and I found it was the general
...e gannet incubated the egg with
...thus got for herself the name of
...ughing at this novel derivation, but
... the middle of the sixteenth century
... Animalium,' Lib. iii., p. 158),† and
...d to with approval since that time.
...mined were of seaweed, mixed with
...ed with straw. None had sticks. The
...ey find floating on the water, but they
...ock itself; and near to the summit there
...ie in the turf which these strong-billed
...gannet is a bit of a curiosity hunter and
...times found by the climbers. I heard of
...ber shoes, children's whips, baskets, etc.!
...spiring turn of mind, carried up a basket
...beer-bottles; and as she could not pull it to
...nest in it, where she sat, enthroned as a
... all the other gannets. The young gannets
...ugly. When they get older they become
...ding. They get to a large size before the black
...white, are seen cropping up; then the soft
...wanted any longer, and the plumage of the

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...gannet to lay two eggs, as I supposed (see Macg.,
...also see Mr. Gray's comments (*B. of Scot.*, p. 461).

...the above I am indebted to Professor Newton.

and tail, shoots out; the wing feathers develope and the black bird waddles forth, an unwieldy at. He has to try a little "banting" before he can he takes himself away, for the old gannets do not like ck sheep" at home, and I did not see one at the Bass, I picked up a last year's bird, dead and dried, in the ediate state of plumage.† Young birds, old birds, nests, , everything connected with them, give forth a terrific odour. e fishermen say, if the wind is strong, they can smell the old Bass and its fishy inhabitants miles away. But all this is changed in winter: then the wet and the spray wash the great rock down, which resumes its pristine tint of brown. In old days, the gannets used to breed on the grassy slope of the Bass, where their nests were very accessible; but prying egg-dealers, persecuting

* The white plumage begins to appear on the throat, breast, and belly, at the age of one year, as I found out from a specimen in the Zoological Gardens; which, when I saw it, a few days after it was deposited, in September, 1870, had some down upon it. Change of plumage in captive birds may be delayed, but can hardly be accelerated, by confinement, so that it was a proper example to form an opinion upon.

This seems the place to offer a remark or two on the Black-tailed gannets. Clusius speaks of a black-tailed gannet from Færoe, and Dr. Cunningham remarks in the *Ibis* (1866, p. 5) that the statement reminds one of the South African *Sula melanura*; and adds, that it was probably only an indication of youth. [I believe the South African bird's real name is not *Sula melanura*, Tem., but *S. capensis*, Licht.] Clusius' is not the only instance of our northern species assuming the distinguishing colours of the southern, for Gould in his *Birds of Europe*, figures a gannet of Temminck's which came from Iceland; and Mr. Gray in his appendix alludes to examples which have been observed at St. Kilda (*B. of Scot.*), and Mr. Macgillivray to another which was killed on the Bass (*B.B.* v., 420), where, also, Mr. Gray informs me (*in epist.*) that he has seen examples, adding his conviction that the black tail is only the last trace of immaturity not yet effaced. Mr. Gray also tells me that he has examined gannets which were adult, excepting that they had one or two black feathers in their tails, and I remember seeing one so marked at Hastings. We may hold it as settled that the black rectrices are the last remnants of a youthful garb which the gannet throws off, as they are also nearly the first to come; and that in our northern seas, the South African *Sula capensis* with a black tail has never occurred.

† I am told that a few young birds make their appearance abou the 12th of May.

tourists, and cockneys from Edinburgh, could not allow that state of things to go on, so they pelted the birds and changed their eggs, and at last drove them all away to the precipices on the east and north sides, where at the present day it is computed that they muster something like 10,000 strong.

Over these precipices, when the time comes for the young to be killed, an active man is lowered by means of a rope. He had need be one of undaunted nerve, for he holds his life in his hands; but these fellows get so accustomed to it that they could swing on the end of a pack-thread if it would bear them, with 300 feet of space below them, with the greatest composure; though my guide did confess to me, that there were times when the stench from the birds, and the heat of the sun's rays, refracted by the solid trap, had nearly been too much for him. The bold cragsman knocks as many of the young gannets on the head as he can, and pitches them into the sea below, where a boat is waiting to pick up the unsavoury spoil. A hundred or more are often taken in a day, but the number depends entirely on the weather. If it be wet, the cliff is very likely slippery, and if rough, a boat cannot approach the rock. The cragsman and the lessee scrutinize the clouds with as much anxiety for their feathered harvest as the farmer does for his crops, and according to the weather so is their take.

The Sea-Birds Act has not given more satisfaction at the Bass than at other places. The present lessee hoped to reap a rich harvest, but he finds that it has done him more harm than good. Formerly, shooters were content with a few birds if they could come and kill them when they liked; but now, directly August is up, there is a general desultory popping of an army of skirmishers. The shooters know that their time is limited, and they make the most of it before the birds are off. Their motto is, "Make hay while the sun shines," and the birds know no peace. It is not the young ones they kill, which signify so much as the old ones. A good many of the young must always escape, but it is the old birds that have not yet laid aside their tameness, which get wounded by long shots and go away to die, which matter most,—breeding birds, which have taken many years in arriving at maturity. The young may be all the better for being killed down in moderation; as in a rookery, which, if left to itself,

will throw off colonies every year, and decrease the parent stock. Most of the guillemots, etc., are able to take care of themselves by the 1st of August; but the close time ends a good fortnight too soon for the gannets, some of which have still young which cannot provide for themselves. Though wild enough in all conscience in the winter, they are sure to be tame so long as they are held by affection's ties, and easy to murder. Those who shoot them in the beginning of August, flying with fish in their mouths to the Bass, have the satisfaction of knowing that they have made a young one to perish of hunger, and there have been brutes, calling themselves men, who to gratify a spite against the lessee, have taken this wicked revenge. He told me himself, that he had seen the sea strewn with dead gannets, and that they did not even take the trouble to lift them when they had shot them.

It is the gannets' misfortune that they take longer than other birds in the task of incubating, and they pay a dear penalty for it.

I have now finished with the bird for which the Bass Rock is famous, but a few other species require notice. My boatman stated, that he believed the black guillemot—and he knows it well—breeds in very small numbers. I was not lucky enough to see one. I saw a good many parties of common guillemots, and pairs of puffins. I saw only one razorbill, and I found them equally scarce at the Ferne Islands, and Flamborough Head. Speaking of puffins, they are said to breed in the old buildings, the dungeon, and the ancient fortalice. Perhaps the rabbits have dispossessed them of their burrows on the grass.

Of land birds, pipits are common; the wheatear and the wagtail are also there; and I dare say the prisoners of old might sometimes have heard the blackbird pouring out a lively ditty. What gave my boatmen the greatest satisfaction to see, was a beautiful pair of peregrines on the east cliff, for one having been shot a short time ago,* they feared, not knowing the habits of the bird, that the other might not find a mate, in which case they would have lost a good price, which they always make of the nestlings. They looked with much less pleasure on a large flock of jackdaws. A few years ago an attempt was made to destroy these egg-sucking thieves by eggs seasoned with strychnine, and slices of bread

* I saw this, a fine female, at Mr. Small's, birdstuffer, Edinburgh.

doctored with the same, and many score of them succumbed; but it was found that the gulls took the bait too. The gannet of course was safe, for he is exclusively piscivorous.

I hope that my paper has not been unduly spun out, but the subject was too interesting to admit of any abridgment. The gannet is one of the most remarkable birds in ornithology, and the island-rock] which from time immemorial has been its chief home is replete with historic associations. The Great Northern Railway takes the traveller within easy distance of it, and no painter, archæologist, or naturalist, who has a day to spare, if it is in the summer time, should pass by the Drem station without stopping to see the old Rock and its feathered inhabitants. Of the former I may say, *Primus inter pares*, and of the latter, *Primi inter omnes.*

II.

NORFOLK DECOYS.

By Thomas Southwell, F.Z.S., *Hon. Sec.*

Read 26th November, 1878.

"The age when decoys were prevalent," says Folkard, "may be appropriately termed the 'middle age' of wild-fowling; all previous systems of taking wild-fowl by nets, snares, lime-strings, lime-twigs, lime-rods, and otherwise, sink into insignificance when compared with the peculiar ingenuities of the decoy, and the subsidiary schemes of the flight-pond." Had he said, that with decoys the art of fowling reached the *acme* of perfection, I think he would have been more correct; for, although all methods of wild-fowling depend in a more or less degree, for their success, upon the skill and ingenuity of the fowler, added to a thorough knowledge of the haunts and habits of the quarry, still, if *numbers* be taken as the standard of success, all the earlier modes of taking fowl are as far inferior to the decoy, as the

cross-bow to the fowling-piece of to-day; hawking, as the mere pastime of the rich, would of course at no time compare with it. When decoys were first used in this country, so far as I have read, does not clearly appear. A very early date has been assigned to them, and it is said that they were common in England in the time of King John; mention is also made of them as forming the subject of litigation in Lincolnshire, in 1280, 1415, 1432, &c.; but I am inclined to think, from the way in which the operation is spoken of, that the means by which the great quantities of fowl were taken in those days, consisted of *driving* into nets constructed somewhat on the plan of the modern decoy, and not of enticing the birds to their destruction, as in the decoy proper. Various accounts of this method of taking fowl when too young to fly far, or during the moulting time, are extant. Willughby says, that sometimes as many as 400 boats were employed, and that 4000 mallards have been taken in one driving at Deeping Fen. To such an extent was the destructive practice carried, that in 1534 an Act was passed, prohibiting this mode of taking fowl between the last day of May and the last day of August; but the method appears notwithstanding, to have been well known to Willughby in 1676; and when Gough in his edition of Camden, says that about the year 1720, wild-fowl so abounded about Crowland, that in the month of August the owners sometimes *drove* as many as 3000 ducks into a single net at one time, it appears to me that the end must have been accomplished by this illegal means. An Act of Parliament, 10 Geo. II., c. 32, referred to by Pennant ('Brit. Zool.' ii., p. 503) also prohibits the taking of fowl from 1st June to 1st October.

Spelman says, that Sir William Woodhouse, who lived in the reign of James I., "made amongst us (*primum apud nos instituit*) the first device for ducks, called by the foreign name of 'a koye'" (Spelman's English Works, 1727 edition—Posthumous Works—p. 153); whether he was the first to adopt the name as well I do not know, but this passage has often been quoted as proof that he constructed the first decoy in England; be this as it may, there can be no doubt that he introduced some important improvement, and it is quite possible that he was really the first to construct the decoy proper as distinguished from the old method of driving. It is not my intention, however, to enter into anything like a history

of decoys, as I have neither the acquirements necessary fo quarian research, nor the leisure to pursue it; I will merel that although Folkard has two excellent chapters on the su there is still ample scope for further investigation. Neither s say anything about the practical working of a decoy, as I never had the good fortune to be present on such an occa and the mystery which so long surrounded its sacred pre has been at length dispelled, first by Pennant, then by own Lubbock, and finally, all that is known about pra decoying so carefully epitomised by Folkard, that very remains to be said on the subject.

The way in which author after author copied the grossly al statements of his predecessors, shows how little was known ou the decoy, of what occurred within its carefully guarded precin of the results of the working of the many decoys which form existed in this country, very little is known, and for even little we are indebted almost to accident. Pennant mentions something over 100 years ago, 31,200 ducks were taken in season in ten decoys in the neighbourhood of Wainfleet, and the decoymen "would be glad to contract for years to deliver t ducks at Boston for 10d. the couple;" and the books kept at celebrated Ashby decoy in Lincolnshire, were published some y ago, by which it appeared that during the period from 1833- 1867-8, no less than 95,836 fowl were killed in that decoy alon but these are very exceptional cases, and the decoys, onc numerous in the counties of Lincoln, York, Essex, Norfolk, Suffolk, may be said almost to have disappeared from the of the country, leaving little more than a name to mark their and not always even that.

I have been for some time engaged in collecting such informa as I could obtain with regard to the decoys of Norfolk, feeling if not done at once, the opportunity will soon be passed, and to a considerable extent it has already passed away; some of results of my inquiries I purpose to lay before you in this pape

First, however, let me say that though the dearth of materi grievously disappointing, and the difficulty of obtaining what l there is known, by no means slight, from the too general abs of any records, in one thing I have been very agree surprised: my inquiries in every instance have been met with

ıtest kindness, and all the information it was in the power of ıy correspondent to give, was at once accorded with perfect frankness; the forbearance shown to a most troublesome correspondent merits my very best thanks, and these are especially due to Mr. Wyrley Birch, the late Lieut.-Col. Duff, Lieut.-Col. Leathes, Sir Savile Crossley, Mr. H. E. Buxton, the Rev. E. W. Dowell, Mr. H. M. Upcher, Mr. R. Fellowes, Mr. Stevenson, Mr. William Castell Southwell, and Mr. T. L. Reed of Downham—to whom I am indebted for much of the information which I am enabled to lay before you. I purpose dividing the decoys of Norfolk into two classes, disused and active, and will take the disused ones first. Of these,—including the district known as Lothingland, which, although geographically part of Suffolk, from its situation we have regarded zoologically as part of our own county—I have succeeded in tracing the remains of twenty-three, one of which, in the parish of Lakenheath on the Suffolk side of the little Ouse, I thought it better to include, as it belonged to a numerous group of decoys which were worked with great success in the extreme south-west corner of the county. Two other old decoys, also on the Suffolk side the boundary river, are marked on the Ordnance map, one in the Duke of Grafton's park at Euston, the other at Worlingham near Beccles; these I must leave to the historian of the sister county, should one be found, which I hope will be the case, but the authenticity of the former I believe to be doubtful.

Commencing with the extreme south-east of the county, the following is a list of the disused decoys which have come to my knowledge: doubtless there are others of which I have never heard, but should be only too glad to be informed. They are to be found in the parishes of Flixton, Mautby, Acle, Ranworth, Woodbastwick, Hemsby, Somerton, Waxham, Gunton, Wolterton, Cawston, Hempstead, Langham, Holkham, Dersingham, Wormegay, Narford, Stow Bardolph, Hilgay, Methwold, Hockwold, Lakenheath, and Besthorpe.

At *Flixton* near Lowestoft, on a piece of water of about sixteen acres in extent, and still known as the "Decoy Lake," are to be found the remains of an old decoy. When it was made, or even when it was last worked, I cannot ascertain; but, although traces of the pipes are still plainly visible, my informant assures me that it has to his knowledge been in its present condition for more than

fifty years. The decoys in the Fritton Lake, not far distant, have been constructed very many years, and probably that at Flixton is of an equally ancient date.

Proceeding north we come to *Mautby*, where a decoy formerly existed, which, as might be expected from its situation, was highly productive. When it was given up, is not known exactly; but Mr. Fellowes, of Shotesham, kindly lent me a letter from George Skelton,* dated Winterton, March, 1833, offering to hire it. From

* The members of the family of Skelton were formerly as celebrated for their skill in constructing and working decoys, as were the Barrs and Pells for falconry. Mr. Lubbock has left on record the astonishment of the Norfolk decoymen at the mode of proceeding adopted by George Skelton, when he made the Winterton decoy; and I have very little doubt, most of the decoys of this county were either constructed or re-modelled by members of this family (many of them certainly were) and that they were the introducers, if not the inventors, of very great improvements in this method of taking fowl. Of their great skill in the practice, there can be no doubt. I must refer the reader to the appendix to the second edition of Lubbock's *Fauna of Norfolk*, where, at page 221, will be found some account of George Skelton's improvements, and his reasons for adopting them. Old George Skelton came originally from Friskney in Lincolnshire, in what year I have not been able to learn, but probably about the beginning of the present century. He set up and worked the Winterton decoy: but on the 30th of March, 1833, he applied by letter to Mr. Robert Fellowes, offering to hire the Mautby decoy; Mr. Fellowes, however, declined to let it, and he remained at Winterton till his death, which occurred on the 4th January, 1840, in his 80th year; he is buried in Winterton church-yard. George Skelton was accompanied, or shortly followed into Norfolk, by his four sons; George, William, Richard, and Henry.

In 1806, George, the younger, with his brothers William and Richard, erected the Methwold decoy, which they worked for fifteen years; he then appears to have removed to Dersingham, where, about sixty years ago, he set up a decoy; this he worked till his death, which occurred in the year 1857. In the meantime, however, he had worked the Wormegay decoy for a short time, and constructed others at Narford and South Acre; also others in Herefordshire for Lord Bateman, and in Yorkshire for the Duke of Leeds. In remodelling the Wretham decoy he caught a severe cold, from which he never recovered, but died at Dersingham on the 14th February, 1857, at the age of sixty-seven years. George Skelton is described as a "very peculiar man," short of stature, very strongly built, particularly kind in disposition, perfectly indifferent to cold and hardship, well informed, and unequalled in skill in the construction and management of decoys. With all these advantages, he might have died in comfort and affluence; but, unfortunately, late in life he gave way to a passion for drink, which greatly impoverished

this letter it appears, that the decoy was even at that time out of repair. Mr. Fellowes declined Skelton's offer, preferring the shooting, and the decoy has never been worked since. The pond is still the resort of large numbers of wild-fowl, which retire there from the great feeding grounds on Breydon, and the place is kept perfectly quiet, the pipes and screens remaining. No decoy books can be found; but Mr. Fellowes says, he has always understood that the quantity of fowl taken was very large. There is also a large heronry in the trees surrounding the decoy pond.

In the parish of *Acle* are still the remains of a decoy, which was worked about forty years ago by a man named Johnson. Mr. T. L. Reed, of Downham, tells me, that he has seen fowl taken there; but, I believe, it was not worked many seasons.

him. A gentleman who visited him when on his deathbed, has kindly furnished me with the following account of his visit. "The house stood quite alone in the marshes, no great distance from the sea-shore, and was at that time at least two miles distant from any other house . . . . it consisted of a long, low, rather gloomy room. On asking for him, his wife or one of his children, pointed to a corner of the room. On looking there, I could see nothing but duck and wild-fowl, hanging on strings. On repeating the question where Skelton was, some of these strings of wild-fowl were taken down, and I found him lying on a four-post bedstead. These strings of wild-fowl were stretched from one post to another all round the bed, so as to form regular curtains, if I may so term it, and shut him in so completely as to prevent his being seen. He died from a thickening of the membrane of the throat, brought on by exposure to damp and cold, and aggravated by his habits of intemperance." George Skelton was twice married, and left one child by his first wife, and five by his second.

William Skelton removed to Binley in Warwickshire, and constructed a decoy for Lord Craven at Combe Abbey, which he worked till his death. His two sons and grandson are now tenants on the Combe estate.

Richard Skelton was for many years decoyman for the Gurney family at Hempstead; he left that place, and took a decoy at Methwold shortly before his death, which occurred about the year 1849, at the age of 53 years. He had five sons, three of whom died young; Richard is now decoyman at Illingham near Maldon, Essex; and Henry is gamekeeper at Woolley Park, Wantage. There was also a daughter, who married, and is now living at Southery; to whom I am indebted for much of the information contained in this note.

Henry Skelton, the fourth son of Old George, succeeded his father at the Winterton decoy; he died on the 22nd of August, 1861, aged 52 years, and is buried at Winterton.

There were, I am told, three pipes which are now just visible, but very much grown up; and the "car," now grown to fair-sized trees, is very much improved by drainage. The land is the property of Lord Calthorpe.

Still farther inland, on the margin of *Ranworth* Broad, is a decoy, which possesses peculiar interest, from being the source from which Mr. Lubbock derived the practical acquaintance with decoying, which enabled him to write the interesting chapter on this subject to be found in his 'Fauna of Norfolk,' and which was the first really reliable account of the working of a decoy, which had up to that time been published. The Ranworth Decoy is now dismantled, and the pipes rapidly growing up; it is not, however, more than about nine years since it was last used by its late proprietor, Mr. John Kerrison; and some memoranda, very imperfect it is true, of the fowl killed between the years 1862 and 1866, were kindly lent by the Misses Kerrison to Mr. Stevenson. The season of 1864-5 is the only one of which a complete record is given, and from this it appears that the decoy was worked three days in October, and then at intervals of a day or two up to the 7th of April; the result of the season being: 877 ducks, 70 teal, 8 wigeon, 3 shovellers, 1 pintail, 1 tufted duck, and 1 goosander; a total of 961 fowl. The 8 wigeon were taken: 4 in December and 4 in January; 1 of the shovellers in January and 2 in April; the pintail and tufted duck in January; and the goosander in March. 372 fowl were taken in February, which is nearly double the number taken in January, the next best month. The decoy-man formerly in Mr. Kerrison's service, and now keeper on the Broad, told me that the take used to be about 1000 each season; but that when the *Anacharis alsinastrum* abounded so at Hoveton, it greatly interfered with his takes, as the ducks were so fond of the weed, that nothing he could offer them would tempt them to enter the pipes. The Broad contains about sixty acres of water, and there were ten pipes.

Still higher up the River Bure, is a small broad in the parish of *Woodbastwick*, known as the "Decoy Broad," which derived its name from the use to which its waters were put; the remains of the pipes are still plainly visible, but I am informed by an old resident, that it has not been used as a decoy in his experience, which dates back seventy years.

Returning towards the coast, at the northern extremity of Ormesby Broad, in the parish of *Hemsby*, are the remains of a decoy, which has long been disused. It belonged to the family of Waters, who have only recently disposed of the property; and Mr. Edward Waters, who was born at the "Decoy Farm," tells me that it was worked by his father, and he has heard that very large catches were often made. The decoy was situated on the margin of the Broad, in a "car," just behind the house, and remains of the pipes are still visible; but, Mr. Waters believes, it has not been worked since the commencement of the present century, and that no one is now living who can remember it.

Close to the coast, and a little farther northward, we come to the celebrated *Winterton* Decoy (so-called, but really in the parish of East Somerton), an interesting account by Mr. Lubbock, of the construction of which, will be found in the appendix to the second edition of his 'Fauna of Norfolk.' This appears to have been the first decoy made by old George Skelton in Norfolk; he continued to work it up to the time of his death, which occurred in January, 1840, and was succeeded by his son Henry. From the puny size of the water, it excited the amusement of Skelton's fellow decoymen; but in the second year of his superintendence, much to their astonishment, he took 1100 teal in seven consecutive days. This is almost the only fact known about the take of fowl at this decoy; but there can be no doubt, that in such a situation, and in such skilful hands; it was very large. The Winterton Decoy passed from Mr. Huntingdon, for whom it was originally constructed, to the late Mr. Joseph Hume; whose son, a few years ago, disposed of the property to Captain Bird, since which time it has not been worked; the proprietor, as with the Mautby and Ranworth decoys, preferring duck shooting to decoying.

Not far from Somerton was the *Waxham* Decoy, situated in a large marsh. It is probable that this decoy was constructed by Sir William Woodhouse, who, according to Spelman, in the reign of James I., was the first to introduce decoys into these parts: it certainly is a very old decoy. The marsh is now drained, and the site of the decoy planted with osiers.

Mr. Purdy informs me that at the south-west corner of *Wolterton* Park, there is a wood called the "Decoy Plantation," and in it the remains of what was apparently once a decoy; he was unable,

however, to learn anything with regard to it, except that it certainly has not been worked during the past fifty years.

In the Bluestone Hall plantation at *Cawston*, there was formerly a decoy, but when it was last used I cannot ascertain. Captain W. E. G. L. Bulwer, in reply to Mr. Norgate's inquiries, states that it was there at the beginning of the present century; but he thinks it was probably done away with by his grandfather, General Bulwer, when he headed the pond and enlarged the water. Captain Bulwer doubts whether there is anyone living who could give any information about it; and the only person he names as likely to do so,—a man who, he says, "remembered feeding his cow where the great pond now is,"—has recently died.

In *Gunton Park* there was formerly a decoy; it was constructed in 1803 or 1804, by William, second Lord Suffield, but when dismantled, I do not know. There are three pipes, and thirty acres of water. Here also, as at Mautby, there is a heronry.

Again, returning to the coast, and within a few miles of the sea, we come to *Hempstead;* where a very productive decoy, in the possession of the Gurney family, was worked up to about the year 1845; when the decoyman (not Richard Skelton, but his successor) having been detected in carrying on an illicit still, hidden in the woods, by means of which he converted the pheasants' barley into whiskey for his own use, was, of course, summarily dismissed, and the decoy, having fallen into dilapidation, was never afterwards worked. Here, Richard Skelton, son of the Winterton man, was long decoyman; and I have been told, by a person who knew him, that the decoy was very productive, as many as three or four hundred ducks having been taken at once. No decoy book, so far as I can learn, exists, and of course nothing will ever be known about the number and species of the fowl taken, and even those few who remember the decoy will soon pass away.

Not far from Hempstead, and nearer to the coast, was a decoy constructed at *Langham*, by the late Captain Marryatt, R.N. In the year 1854, after Captain Marryatt's death, the property was purchased by Mr. S. F. Rippingall, and the decoy dismantled. The site of the decoy is now a field, with a small stream running through it: plantation, lake, and decoy—all gone. The Rev. E. W. Dowell, tells me, that he has several times seen this decoy worked, and that he thinks the proportion of fowl taken was about:

wigeon, 3; mallard, 2; and teal, 1. Since its destruction the wigeon have taken to the Holkham Lake as their day quarters, and may be seen there in thousands. Previous to 1854, there were only mallard and a few stray teal, tufted and other ducks, on the lake at Holkham.

On the marshes at *Holkham*, about half a mile north of the church, traces may still be seen of an old decoy; it is many years (perhaps eighty) since it was worked, and Lord Leicester doubts whether there is any one alive now who can give any information about it. In a map of Norfolk, published by Faden in 1797, this decoy is marked. In the lake, not far from the site of the old decoy, is a flourishing heronry.

Still following the coast line, we come to another disused decoy at *Dersingham*, constructed about sixty years since by George Skelton the younger. Skelton died at Dersingham, and was succeeded by a man named Sharp, who came from Hilgay, but in consequence of alterations in the drainage of the fresh-water, and the drying up of the creek, on which it stood, the decoy ceased to answer, and was broken up about eight or ten years ago. The pond, which consisted of about one and a quarter acres of water, carried five pipes. Skelton's brother-in-law, who worked the decoy with him, and is now living, says the average take per season was from 130 to 200 dozen wild duck, teal, wigeon, gadwall, and pintail. No decoy book was kept. A new residence was built for Sharp; but he does not seem to have been very successful, and his family suffered from bad health; he, therefore, soon gave up the decoy, which has never been used since.

On the River Nar, which enters the Ouse at Lynn, situate in the parish of *Wormegay*, is a decoy, which George Skelton worked for a short time while he was still resident at Dersingham. The enclosure consists of twenty-two acres, and the pond of over an acre, on which there were four pipes. An old inhabitant writes me, that the decoy was last worked in 1838; but that "about sixty years back John Balls occupied the farm and decoy, and had some very good years: he made several hundred pounds in a few years. The last year it was worked, the amount received was only twenty pounds; such was the report at the time. It was very much out of repair, but one old decoyman informed me, that if he could have it for a term of years he would

have accepted it, and put it in repair; this man's name was Skelton. He occupied it for one year, about the date of 1842; but he, poor old man, had a great failing: the squire said he killed his game, so no more of him."

About fifteen or twenty years ago, if my informant, James Plumb, who was for many years decoyman at South Acre, is correct in his date, a decoy was made at *Narford;* it was not worked long, however, and is now dismantled, and the materials sold.

Not far from Downham Market, in the *Stow Bardolph* fen, are the remains of a decoy; about which, I can only learn, that it has not been used for fifty-five years. It is on property belonging to Sir Thomas Hare, and, in its day, must have been splendidly situated for wild-fowl.

Another decoy existed on the *Wood Hall* estate, in the parish of *Hilgay;* it was known as the "Old," or "Wood Hall Decoy." When it was made, I have not been able to learn. It was worked by a man named Wilson ("Old Ducks") for a few years, and then, as it did not answer, he gave it up: this would be about twenty-five years ago, and it has not since been worked. The pond is quite grown up.

For what is known of the history of the next three decoys, I am much indebted to the kindness of Mr. H. M. Upcher.

On a tract of land called the "Severals," in the parish of *Methwold*, and not far from the preceding decoy, stood another which was built in 1806 by William Skelton, who, with his brother George, worked this and the "Wood Hall" decoy for fifteen years; at which time, the fens became so flooded that they could no longer work them at a profit. They remained unused about three years, when Mr. Wilson hired the land of the Duchy of Lancaster: this was in 1824. Wilson repaired the pipes, &c., and caught "a great many wild-fowl, chiefly duck, wigeon, and teal." "I have known him," says Mr. Upcher's informant, "to catch spoonbill (shovellers), pintail, pocker, gray-bird (gadwall), and wewen (wigeon). I think, the pintail is the prettiest and noblest looking bird of all I have catched in the decoy. I cannot tell the exact number drove up at once, but I am certain three to four dozen have been taken at one drive up. I remember on one occasion, in the afternoon, Mr. Wilson killed as many wild-fowl as a man could take home on a wheel-barrow." Wilson died about

1856, and his widow kept on the decoy, with one, Williams, as a decoyman. She gave it up to her brother, Mr. Harwin (my informant) in 1862. Williams continued to act as decoyman, for about eight years, when one night he fell into a fen ditch and was drowned. Harwin says he had some good seasons; "on one occasion, when a thaw set in, the fowl came in hungry from the sea-coast, we drove up seventy-five wild ducks at once, being the most I ever saw taken at once. I have seen from fifty to sixty taken many times. After Williams' death I managed the decoy myself two years; my fortune in decoying was not so good as hitherto. The duck catching was nice amusement, but the working the decoy was trying work in frosty weather." This decoy was given up in 1872, and has not since been used.

A decoy in the parish of *Hockwold*, last worked by one Burgess, about forty years ago, was discontinued in consequence of its being too close to the next-mentioned for both to be worked with profit.

Another old decoy was situated in the parish of *Lakenheath*, just on the Suffolk side the border, but so near that my referring to it needs no excuse. Mr. H. M. Upcher has kindly supplied me with the following information with regard to it. He says, "I can find out nothing about the time of its being made; the last man who worked it was a Mr. Williams, who hired it of W. Eagle, Esq. Williams one year cleared £1000; he used to send up a ton and a half of duck to London four times a week. One old man declares he once saw 3000 fowl sitting outside the decoy in the fen waiting for those inside to be taken to make room for them, as the decoy was so full, it looked as if you could not prick a pin in anywhere. This has not been worked for about twenty-five years, and the pond is now entirely grown up; it was the best decoy in the fen." This decoy was abandoned at the time the railway was made from Brandon to Ely, and I am informed that the proprietor brought an action against the Railway Company for damages, which he recovered. I have not, however, succeeded in finding any report of the case (if it ever came into court), nor can I learn any particulars about it.

One more old decoy, and I have enumerated all that I have been able to discover; this was situated on what is still known as the "Decoy Common," in the parish of *Besthorpe*, near Attleborough. The Rev. Edward Bannister informs me, no one is now living who

remembers the decoy being worked; but it is probable that it was disused about the time of the enclosure of the common, sixty-three years ago. An old man, eighty-five years of age, who has resided near the plantation all his life, tells Mr. Bannister, that the common was generally under water, and that ducks used to resort to the neighbourhood up to the time of the enclosure; he, however, can give no information as to the working of the decoy.

Such are the scanty records, I have been able to collect, of the disused decoys of Norfolk; doubtless, although the present list is by no means a short one, there may have been others which I have failed to discover, and some of those enumerated may have proved failures, and been used only for a short time. With regard to the dates given, it must be remembered that my information has been generally from hearsay, and that although I have been at the greatest pains to check one account against another, I cannot in all cases vouch for their accuracy. Where there is nothing to fix the dates, I fear, they must generally be taken as approximate, but I do not think they will be found to err very greatly. It is not unlikely there are people now living who could add greatly to the information I have been able to collect, but it is remarkable how rapidly all knowledge of this once important branch of industry—although a thing of only the immediate past—is fading away, we can only look upon the decoys now working (in our county at least) in the light of duck preserves, worked by the proprietors, more for sport than profit. Of some I have mentioned, really nothing is known, of others very little, and the imperfect statistics relating to the Ranworth decoy, which was worked by its proprietor, is the only instance, I can find, in which such a record of the fowl taken in any of the disused decoys, was kept. This is, no doubt, owing to the secret nature of the decoyman's occupation, which could only be pursued in solitude, and his interests led him to keep the results of his operations to himself. I am happy to say that the few decoys now existing in Norfolk, are all worked by their owners, who are actuated by no such motive, and we may still hope for some useful information, even though it be at the eleventh hour. The existence of the remaining decoys, however, is precarious in the extreme, should their proprietors prefer to shoot the ducks rather than to decoy them, as has frequently been the case of late, these ancient

institutions will soon become things of the past, and it is quite possible that the next generation may look back upon decoys, as we do upon flint-locks or threshing-flails.

We now come to the *Active Decoys*, of which there are six in all: two groups on the Fritton Lake, one at the Herringfleet, and the other at the Ashby End; one at Westwick; one at Wretham; another at South Acre; and the sixth at Didlington. Commencing as before in Lothingland, we find on the Fritton Lake, which is about three miles in length with an average width of about three hundred yards, the remains of six disused pipes on the north side, and two on the south side. The only pipe now worked on the north side of the lake is in the parish of Fritton, at the Hall Farm. Lieut.-Col. Leathes works three pipes (formerly five) at the Herringfleet end of the lake, and Sir Savile Crossley four more pipes at the Ashby end. Col. Leathes says, that he has no idea when the decoy was first worked, but that it is certain it has existed over two hundred years, and that it has been worked by his family one hundred and sixty years. When John Fisk (the old decoyman, previous to 1848) made what he called a "good haul," Col. Leathes says, the stone pavement in the court-yard at the hall, used to be covered from end to end with ducks taken in one day; it took six hundred fowl to do this, and he would average two hundred ducks per day often for weeks, and this only at the Herringfleet decoy, whilst equal takes were being made at the Ashby end. Within the last fourteen years, two thousand ducks have been taken at each end in one season, but lately the average has not been one thousand; in 1877-8, the take was very small. Success depends entirely upon the season and weather; large numbers have been captured in November and March, but January and February are, as a rule, the best months. The season of 1867-8, was the best during the last twenty, but, as a rule, not one-twentieth of the former number are taken now. About 1820, the decoy used to pay £300 per annum, after deducting all expenses. Duck and mallard formed the largest portion of the fowl, then, in order, wigeon, teal, pintails, and pochards; shovellers rarely of late, a few goosanders, and a gadwall or two. The proportion of the sexes seemed pretty even, but sometimes, though rarely, mallards were taken without ducks. "There can be no doubt," says Col. Leathes, "that railways, threshing-machines, and

drainage, have greatly decreased the number of fowl of late years; but the great evil has been the flight shooting up to the very banks of the decoy." The decoy books unfortunately cannot be found, so that it is impossible to give any exact statistics of this decoy; but the number of fowl taken here formerly was doubtless very large. In Col. Leathes' decoy, all the pipes being on the south side of the lake, they cannot work with a northerly wind; which is a great disadvantage.* The practice has been to work this decoy about sunrise and sunset; but often on moonlight nights (especially when the ducks had been well fed and did not go on flight in consequence) a good number have been taken, and old John Fisk used to say, there was no time better than quiet moonlight nights. There is a portrait of a large Newfoundland dog at Fritton Hall, which, many years ago, was a celebrated decoy dog; but, generally, a small dog is used, with the occasional addition of a red handkerchief round its neck. Ferrets are by some esteemed even more than dogs, but, being short-lived, they die almost as soon as they have completed their training.

At the Ashby end of the lake, Sir Savile Crossley works four pipes. There is nothing known as to the date of the construction of the decoy, which is, doubtless, as old as that belonging to Col. Leathes. The fowl taken, are duck, teal, wigeon, pintail, shoveller (the latter rarely, only one in the last ten years); pochards are seen in great numbers, but they are never caught. The best months are November and December for ducks; March for teal and wigeon. In this decoy more male ducks are said to be taken than females, perhaps eight out of twelve are males; and many instances have occurred of mallards being taken without ducks. Agricultural operations have very largely affected the number of late years. The number of fowl taken since the year 1850, is known, and Sir S. Crossley has very kindly given me the numbers from the season of 1862-3 to 1876-7. During that time (fifteen seasons) 10,476 duck, 1,311 teal, and 1,634 wigeon, making a total of

* The take at the Herringfleet end of the lake, in the season which has just closed (1878-79), was only about 400 fowl; whereas, at Sir S. Crossley's end, 1533 were taken; this is, probably, owing to the slightly different aspect of the latter decoy, as large numbers of fowl have frequented the lake during the past winter. In the season of 1877-78, only 267 fowl were taken at Sir S. Crossley's decoy.

13,421 have been taken; showing an average of 895 per annum. The best season was 1867-8, when 2,278 fowl were taken; in 1869-70 there were 1,483; 1866-7, 1,130; 1874-5, 1,104; 1864-5, 1,063; and 1868-9, 1,045; in all the other seasons the take was less than 1,000; whilst in 1863-4, the number was only 292.

At *Westwick*, about two miles from North Walsham, and six or seven miles, in a direct line, from the nearest sea-coast, is a lovely little decoy, most charmingly situated in, perhaps, one of the prettiest and wildest spots in the county. It was constructed by the late Mr. John Berney Petre, about fifty years ago, and has been worked ever since. The decoy consists of three pipes, and the extent of water is about half an acre. The late Lieut.-Col. Duff, M.P., kindly furnished me with extracts from the decoy book for the last seventeen years; and the average take during that period has been about four hundred each season; since 1872-3, the fowl have been classified, and the number taken in that time (six seasons) is as follows: 2,362 duck, 587 teal, 3 wigeon, and 3 pintail, total 2,955, or about 493 per season: of the teal, 320 were killed in one season. In 1866-7, which was the best year recorded, 761 fowl were taken; in 1877-8, only 320. Years ago, Col. Duff says, that from 1,000 to 1,500 was the usual take. This decoy, from the nature of the surrounding country and its secluded situation, is, I should think, very little affected by agricultural operations; but Mr. Petre does not pursue decoying very energetically, and the man who works it has not been trained to the business, nor does he avail himself of the services of the usual decoy dog.

On the opposite side of the county, at *South Acre*, on the River Nar, is a decoy, made in 1843, by George Skelton, for the late Rev. John Fountaine, and still worked. From James Plumb, who was twenty-three years decoyman there, I learn the following particulars. He believes there was no decoy book kept, but the average take would be about three hundred fowl each season; chiefly duck and teal; pintail were rare; wigeon, three or four yearly; gadwall, a few; and shovellers seen, but none taken. The largest takes were generally in November, but he does not remember any remarkably good years. The numbers of both sexes would be about equal; he [illegible] dom took mallards without ducks. The decoy consists of [illegible] of water, and

four pipes. Agricultural operations have very materially affected the numbers of fowl taken of late years; from being so frequently disturbed they have gradually decreased in numbers. This decoy is about eight miles, in a direct line, from the old one at Wormegay before spoken of, and on the same river.

With regard to the *Wretham* decoy, situate on a piece of water in Wretham Park called "Mickle Mere," Mr. Wyrley Birch has been good enough to give me the following information. The decoy is about midway between Thetford and Watton, and is some thirty miles, in a direct line, from the sea. It was made about fifty years ago by the late Mr. Wyrley Birch, and has been worked almost continuously ever since; there are ten pipes, and about forty-eight acres of water. The decoy book dates from 1868, and Mr. Birch was good enough to send me the annual takes up to March, 1876; what the takes of the previous years were he has no means of finding out, but his impression is, that they were a better average than of late years. The largest take in the nine years was 1,409 in 1870-1; the smallest 125, in 1874-5: this, however, arose from one or two of the pipes being broken down by a heavy fall of snow. The average, over the nine seasons, is 823. The months in which the best takes occur are very uncertain; a good acorn year, makes a bad duck year, as the ducks are continually leaving the water to go into the plantations after the acorns, and will not settle on the water. Very few half-birds are ever killed, sometimes not twenty in the season, though often there are many thousands on the water. The proportion of the sexes is about equal; they generally go in pairs, but, as a matter of course, the duck is occasionally taken without the mallard, and sometimes the other way. Mr. Birch does not think agricultural operations have injured the decoy; this may, however, arise from the piece of water being entirely surrounded by the park and woods, and consequently quite protected from the public. On the Ordnance map at East Wretham, near stone bridge on the "Peddar's Way," is a plantation marked "new decoy;" this, Mr. Birch tells me, is so only in name, and never was used as a decoy.

Some nine miles north-west of Wretham Park, at *Didlington*, the seat of Mr. W. A. Tyssen Amhurst, is a small decoy, constructed by the late Rev. John Fountaine, and still used. It is in

the centre of the park and close to the house; a few wigeon are taken annually, but the principal catch is duck and teal.

In the foregoing brief notices of the decoys, ancient and modern, of this county, I have confined myself almost entirely to the information I have been able to collect, using, in many cases, the actual words of my informants; which, however, I have condensed and arranged as much as possible. There is much yet to learn before reliable deductions can be drawn, the statistics are still too imperfect; but without a commencement nothing can be done, and, I trust, the work of analysing what I have collected, will fall to more competent hands than mine. Whilst thanking those who have so kindly assisted me, I should like to say, that any further information, however trifling in appearance, will be received with gratitude.

III.

SOME RECENT NOTES ON THE AVI-FAUNA OF LINCOLNSHIRE.

By John Cordeaux.

Read 17th December, 1878.

Probably without exception there is no county in Great Britain whose avi-fauna has, from one cause or the other, undergone so complete a change in less than seventy years than Lincolnshire. From a land of wood and heath, mere and marsh, it has passed, by a transformation which may almost be styled magical, into the most flourishing agricultural district in England. Its fens and marshes have given place to dry and sound pasture, its great heaths and barren wolds to fruitful turnips and waving corn; the large woodlands, once the haunt of kite and buzzard, under the exigencies of the time, have been greatly restricted or altogether removed. Could those who knew the county a century ago see it in its present altered state, they would certainly fail to

recognise the face of the country, so completely have the old natural features and landmarks been removed.

In its present and modern conditions, then, our county offers, unless we except its lonely and unchanged sea coast, scarcely any attractions for resident or migratory birds, than are to be found in other districts; comparing it with Norfolk it is positively at a disadvantage, having no portion of its wide extent in any way comparable to the broad and breck districts of that county.

It will not be necessary to my purpose to recapitulate those oft-quoted notices of the old fauna of Lincolnshire which have been made by various writers, from William of Malmsbury (*temp.* 1200) to good old Montagu at the commencement of the present century. These records are more or less familiar to us all, and we question much whether any amount of research would add many facts to those already known respecting the avi-fauna of those olden times. I shall, therefore, confine my notice rather to the actual and present condition of Lincolnshire with reference to the range and distribution of certain species. I may add, that with few exceptions, these notes have been collected subsequent to the publication of my notice, in 1872, of the "Birds of the Humber District," and I have endeavoured, as far as possible, not to trench on old ground.

With the exception of the Common Buzzard *(Buteo vulgaris)*, which still nests in one or two localities, the larger birds of prey have disappeared as residents, and now only occur as rare and occasional immigrants in the autumn, or during their return journey northward in the spring.

Since 1872 there have been two occurrences of the Osprey, both in the autumn, and in the same neighbourhood. The last of these was an immature example, shot at Tathwell, near Louth, in the autumn of 1878. In 1871, May 23rd, a Goshawk was shot in the same neighbourhood. This bird was still in the immature plumage of the first year.

The Peregrine nests nowhere in the county. This, the greatest wanderer of the larger falcons, invariably occurs in the autumn and winter in certain favourite haunts, its food consisting mainly of the wild ringdove and the domestic pigeon. Of the smaller Falconidæ the Hobby nests in both North and Mid Lincolnshire.

Between thirty and forty years ago it was a very regular spring visitant, and nested in all our large woodlands. The Merlin was then as constant a visitant in the autumn and winter, even remaining to nest in the county. Now it regularly occurs in the autumn in North Lincolnshire, and on the coast. The last eggs of the Kite were taken from a nest in Bullington wood, near Wragby, in 1870; since this I have met with no occurrence of its nesting. Sir Charles Anderson, of Lea, in a recent communication remarks: "I can recollect the fork-tailed kite so very common, that when I drove to Lincoln by the low road [say 1811], you might see three or four pair sailing over the Foadike between Saxilby and Lincoln. They were still more common in the woods at Fiskerton, and all the way between Lincoln and Boston. I remember," he says, "one summer evening in, I think 1827, seeing three or four sailing high above the great tower of the Minster, as I was sitting in the garden of the Burghersh Chantry House." Lord Lilford wrote me in 1875: "The last kites I saw alive and wild in England were three, which rose together from the side of the railroad as we passed in the train about two miles south of Lincoln, in September 1850." Ten years later than this, four or five pair might sometimes be seen together on the river below Lincoln, where they almost daily came to feed on any floating garbage carried down from the city. In this autumn (1878) I was fortunate in seeing a pair sailing over the Humber marshes: these were probably immigrants from the north on passage through the county. The only small Falconidæ now in any degree common are the Kestrel and Sparrow-hawk; the former especially numerous in the autumn in the marsh districts near the coast. Many of these seen at that season are undoubtedly immigrants from the Continent.

The Long-eared Owl *(Asio otus)* has certainly become more numerous in North Lincolnshire, and there has also been, from one cause or the other, a perceptible decrease in that useful and harmless bird the Barn Owl *(Aluco flammeus)*. The pulling down of those great thatched barns, sheds, and outhouses, once so common in the district, which used to harbour swarms of rats, mice, and sparrows, and their replacement by modern agricultural buildings, also the restoration of our churches, has had much to do with the extermination of the Barn Owl.

The Great Grey Shrike *(Lanius excubitor)* occurs most regularly

in Holderness and North-East Lincolnshire, as an autumn migrant, no year passing without examples being shot or seen. In the last twenty years I have only taken one note of the occurrence of the Red-backed Shrike *(L. collurio)* in North Lincolnshire. In 1877 a pair were shot near Beverley, in Yorkshire (May 27th and 28th), and the nest with one egg was found.

Subsequent observations to 1872 have led to the conclusion, that the Pied Flycatcher *(Muscicapa atricapilla)* is a much commoner visitant in the autumn than is generally supposed. From the obscurity of the plumage at this season, it is probable, they often escape observation.

Three occurrences of the Dipper in North-East Lincolnshire since 1872, have all proved to belong to the British form *Cinclus aquaticus.*

Mistletoe Thrushes are steadily increasing in numbers, in the autumn also they receive large additions to their numbers from the north. It is a question whether they are not driving away the common Thrush, at least I have thought that this is the case within the bounds of my own premises. In the autumn I have noticed a considerable addition to the ranks of our local Hedge Sparrow *(Accentor modularis)*, only to be accounted for by migration. They are a regular migrant across Heligoland.

The Reed Warbler *(Acrocephalus streperus)* appears to be extending its range slowly northward in Lincolnshire. It has always nested regularly near Lincoln, and in the southern division of the county. Previous, however, to 1876, it was unknown to me in the northern division. In this year I first found a pair nesting in a reedy drain in the Humber marshes, and in 1877 and 1878 two or three pair have visited the same locality. It also nests regularly in the vicinity of Goole, amongst the reeds bordering the main outfall drains.

The next note I give with some reserve, as not proven. Savi's Warbler *(Acrocephalus luscinioides)* has probably occurred in our north-east marsh district as an autumn migrant. I have on several occasions at this season, in September, seen a small reddish Reed Warbler, quite distinct from *A. streperus*, which haunts heavy crops of wheat in the marsh. It has a particular facility for climbing up the wheat stems, and sits near the top, clinging to

the stem, generally choosing the most prominent stalk, as if for a look-out station: on the least alarm it instantly disappears in the dense cover. So far, I have never succeeded in obtaining an example, or finding it when shot at.

The Blackcap *(Sylvia atricapilla)* is always a rare visitant in the northern division of the county. Since 1872 I have once only met with it as a probable nester. It occurs in the spring as a migrant through the district. A gradually increasing species is the Garden-Warbler *(S. salicaria)*, so common in every likely locality, that it may be styled *par excellence* the warbler of Lincolnshire. The Lesser Whitethroat *(S. curruca)*, although common in the best-wooded parts of the county, may perhaps be considered more as a migrant, passing through our north-east district both in the spring and autumn, and not, as a rule, remaining to nest in any numbers.

I have met with at least one example of the White-headed or Scandinavian form of the Long-tailed Titmouse *(Acredula caudata)* in North-East Lincolnshire. I may add that examples in Mr. Gätke's collection in Heligoland belong to this variety. The Marsh Tit *(Parus palustris)* is now much more commonly met with than was formerly the case even a few years since. The often large increase to the ranks of the pretty Blue Titmouse *(P. cœruleus)* which I have noticed in the Autumn, may be due to immigrants. In the present autumn (1878), this increase has been especially marked. After the gale on the night of October 30th I noticed a considerable increase, amounting to small flocks, in the hedgerows and gardens, and a friend observed the same phenomena in the neighbouring parish. Subsequently Mr. Gätke informed me of the immense flights of *Parus major* and *cœruleus* which in the same autumn passed across Heligoland.

The Rock Pipit *(Anthus obscurus)* is in the autumn a very regular visitant to our sea marshes and the coast line. I now never fail to meet with them. It is very probable that some of the examples seen at this season are wanderers from the North of Europe, and may prove the *Anthus rupestris* of Nilsson, the Scandinavian form of our English bird.

Previous to 1872 I had not met with the Woodlark *(Alauda arborea)* in North Lincolnshire; since this year I have twice seen it, once as an autumn migrant, and again in the summer of 1873,

when a Woodlark rose soaring and singing close to a clump of ancient Scotch fir on the "wold" side, on the road leading from Riby to Caistor: after singing for several seconds, it alighted pipit-like on a projecting branch of the firs.

The Tree Sparrow *(Passer montanus)* nests very regularly, and in increasing numbers at least in our northern division. During October, 1878, unusually large migratory flocks arrived on the coast. The pretty little Siskin *(Carduelis spinus)* only occurs as an occasional autumn migrant, and seems partial at this season to the same localities as are frequented by the Goldfinch, haunting the seed-bearing plants on wastes and by the road sides, near the sea coast. A rarer visitant is the Mealy Redpole *(Linota linaria)*. I have only a note of a single example shot during the last five years in this district.

In severe winters Twites *(Linota flavirostris)* probably go southward as we miss them altogether from the salt marshes and coast. I have seen small flocks in our marshes on their return journey about the middle of March, and shot examples having then partly assumed the crimson rump of the breeding season.

The Starling *(Sturnus vulgaris)* is a wonderful mimic of other birds' notes; one in my garden so exactly imitates the call of the Curlew, a bird which frequently in early morning passes over, that I have been constantly taken in by it, and looked up to see the number and position of the passing flock. Sir Charles Anderson, says in a recent letter, "I have observed that the Starlings which have been flying along with the Plover or 'Pyewipe' in the winter have caught the plover's cry. I once heard what I thought was a plover's cry in the garden, and it was a starling. This was in spring, about breeding time."

Both the Rook and the Jackdaw seem to be increasing in number, and also extending their range in the North of Europe, if we may judge by the yearly increasing immigration on to our north-east coasts in the autumn. This season (1878) large numbers of both species came in during October and November.

I have never met with the Wryneck *(Jynx torquilla)* nesting in North Lincolnshire. A pair appeared a few years ago in a garden at Swinhope near Grimsby, and shewed every disposition to remain and nest in an old pear tree; unfortunately their rarity proved their destruction. One was shot at Spurn Point, August 25th, 1873.

The Swift *(Cypselus apus)* is not unfrequently a late straggler in our north-east marshes; some, young birds as a rule, remaining long after the main body have departed. The latest dates I have recorded since 1872, are Oct. 10th, 1873; Sept. 30th, 1874; Oct. 13th, 1878.

The Stock Dove *(Columba œnas)* is gradually increasing, and now nests regularly in this parish where formerly it was quite unknown. I have found Stock Doves nesting in ivy on walls, and on the flat boughs of Scotch firs: it also nests on the Flamborough cliffs and in holes of inland rocks in the Yorkshire dales.

The Turtle Dove *(Columba turtur)*, which quite recently did not occur north of Lincoln, now nests regularly in at least one locality in the extreme north of the county.

The range of the Red-legged Partridge *(Perdix rufa)* is gradually extending, and it is becoming quite common in the southern division of the county, in that part immediately bordering the Wash opposite to the coast of Norfolk; it is also now known as regularly nesting in the extreme north of the county.

It is seldom we find the Grey Plover *(Squatarola cinerea)* in the autumn with any traces of the nuptial dress, yet as late as October 21st (1873), I saw an old bird in full summer plumage on the coast.

The Turnstone *(Strepsilas interpres)* in some instances remains very late in the season. On the 7th of June, 1878, at Spurn Point, near the mouth of the Humber, there was a flock of seven; also a single bird in mature plumage which rose from the sand hills very much as if it had a nest in the locality.

The Bittern *(Botaurus stellaris)* never occurs except as a winter immigrant. Recent appearances of the Bittern have been, as is usually the case, in the depth of winter: since 1872, one in December and four in January.

In 1873, Whimbrel *(Numenius phœopus)* remained on our coast throughout the summer. The Redshank *(Totanus calidris)* has nested recently in two or three localities in North Lincolnshire.

Up to 1872 I was never fortunate in coming across an example of the Wood Sandpiper *(Totanus glareola)*; since this date it has occurred on three or four occasions in the autumn during the latter part of September, and on one occasion in the winter of 1874—75, in December, on the Humber flats. Since 1872 the

Black-tailed Godwit *(Limosa melanura)* has been obtained on the Lincolnshire coast on various occasions from September to the end of the year.

The Reeve *(♀ Machetes pugnax)* is a regular autumn visitant to our north-east marshes, no year passing without examples being seen. On the 18th of August, 1878, I saw a flock of ten in the Humber marshes. Since the extraordinary immigration of the Curlew Sandpiper *(Tringa subarquata)* in the north-east marshes in August, 1873, as recorded at the time in the 'Zoologist' for that year, I have only met with them solitary, or in small numbers, as an occasional autumn visitant. There is a small race or variety of the Dunlin *(Tringa variabilis)* frequenting this district (which must be considered only a local race or variety of that larger race, which in the autumn arrives on our coast in immense flocks from the North of Europe). The habits of this smaller Dunlin differ greatly from those of its congener, the latter remaining on the coast and rarely leaving it; the former, however, I have observed often go far inland to their feeding grounds, partly cleared turnip fields on the "wolds," many miles from the coast.

Our sea birds cannot be considered as coming within the range of our remarks, and it would unnecessarily prolong this paper to notice them. They must be considered cosmopolitan and common to the shores of the Eastern Counties alike. Many interesting and rare examples, in various states of plumage, have come under my notice since 1872. From my own experiences at sea in the spring and autumn, as well as the testimony of others, I am led to the conclusion, that species which ornithologists are apt to consider rare and exceptional visitants to our shores, as the Shearwater, Skuas, Northern Gulls, Fulmar, and Little Auk, with others, are very much more common than is generally supposed. They keep so far out to sea, and are so rarely obtained by collectors, that we are unduly disposed to consider them much rarer visitants than is really the case. Sea-going ornithologists are few and far between, and from the very nature of things, we know much more of the comings and goings of our land and shore birds, than we do of the dwellers on the great waters which wash our lone and sand-girt shores.

IV.

A MEMOIR OF SAMUEL WOODWARD.

By Horace B. Woodward, F.G.S.

(Of the Geological Survey of England and Wales).

Read 25th February, 1879.

Although as a matter of history a man will be known and judged according to his works, yet when these have lent aid in the advancement of knowledge, it is always interesting to learn under what circumstances the labour was achieved.

Norfolk has special reason to be proud of the naturalists she has reared, and it is a pleasant duty of this Society to cherish the records of each one who has furthered any of the studies for which we are united. In pursuance of this plan I need make no apology for submitting a brief account of the life and writings of Samuel Woodward. By Mr. John Gunn he has been styled "The Father of Norfolk Geology," * while his works on the Antiquities of the County, make his name known to and respected by all who seek acquaintance with the subject. Nor were his researches confined to archæological and geological questions; he was an ardent observer in most branches of science, as may be gathered from numerous notes he contributed to the 'Magazine of Natural History.' Indeed, in 1829, before his principal works were published, Dawson Turner (then President of the Norfolk and Norwich Museum) referring, in his address, to the "naturalists of this opulent, enlightened, and scientific county," spoke of Norfolk as then "distinguished for the love and pursuit of science," and mentioned the name of Samuel Woodward among many other of its cultivators.

The only apology I may have to make, will be for entering into

* Annual Meeting of Norwich Geological Society, Nov. 6th, 1877.

particulars interesting only to one nearly related, for which digressions, whensoever they occur, I may perhaps claim your indulgence. My object will be to lay before you such an account of the labours of my grandfather as will best illustrate his work, and to interweave with them such records only of his personal life and occupation, as may serve to explain the force of character that enabled him to achieve what he did.

Boasting no ancestors known to fame,* to wealth, or position, he merely inherited a name savouring of the country, and which originally was applied to one of the custodians of the royal parks or forests.† His grandfather, Simon Woodward, came from London to settle in this city, and married a Norwich maiden, but of what trade or calling he was I have no means of ascertaining. Two children were the consequences of this marriage, of whom the younger, William, afterwards a bombazine weaver at Norwich, was born in 1762, married Elizabeth Springall, in 1789, and died in 1795, at the early age of 33; leaving a young widow and two children. Of these, one was a daughter; the elder was Samuel Woodward, born at Rose Lane, Norwich, on the 2nd of October, 1790.

Of the early years of my grandfather, I should have found very little to say, had not some few notes been written out shortly after his death, by his eldest son, the late Mr. B. B. Woodward, who, at one time had the intention of continuing them, and publishing a short biography. These notes I herewith insert.‡

"His father, who was a man of strong mind and decidedly religious character, died before he was five years old, leaving his mother in such humble circumstances, that she was unable to give

* No direct connection can be traced with the celebrated founder of the Woodwardian Museum and Professorship of Geology at Cambridge.

† Gilpin tells us, in his *Remarks on Forest Scenery, etc.*, 1794 (Vol. ii., p. 19), "With regard to the woods of the forest, which were originally considered only as they respected game, the first officer, under the lord-warden, is the woodward. It is his business, as his title denotes, to inspect the woods. He prevents waste, he sees that young trees are properly fenced, and he assigns timbers for the payment of forest-officers."

‡ The notes were kindly lent to me by Mrs. B. B. Woodward.

him any school instruction. A lady, the wife of his father's employer, however, took such an interest in him, from the precocity of his mind, that she put him to a small day school to learn reading, which in those days formed the sum total of the education of almost all except the higher classes of society. In this he made such proficiency that in half a year his patroness, thinking he might be of some service to his mother, advised her to get him some work to do. She accordingly sent him to a relation who was a shawl weaver, where he used to wind the silk on the bobbins, for the loom.

"The love of learning began already to display itself, not satisfied with what he possessed, which was more than many in his station of life, he learned to write during the noon hour, of a man who went about teaching it, but feeling the lack of time, he continued only a quarter of a year, and shortly after, being employed by a cord-spinner [Mr. Thurlow], he bought a copy-book, and taught himself.

"At this time the bent of his mind was perceptible. His only recreation was the few books he was enabled to purchase by his little earnings, and the few religious books his mother possessed. Often has he spoken of the zest with which he perused and reperused 'Bunyan's Pilgrim's Progress,' and a large picture Bible, and that boy's own book, 'Robinson Crusoe.'

"In 1800 (?) an organ being erected in St. George's Colegate, in which parish he lived, he was engaged with several other lads to form a choir, and thus was introduced to John Herring, Esq., Alderman [at one time Mayor] of this city. This gentleman was much pleased with him, and offered employment in his manufactory [for weaving camlets, bombazines, etc.].

"On this new occupation he entered when eleven years old, and was at first employed in packing, etc., in the warehouse, and occasionally in writing. Mr. Herring [by the wish of Madam Herring] gave him nearly half a year's instruction at an evening school in arithmetic and accounts, and this, with what has been mentioned above, was all that he ever enjoyed of the advantages of education. At the age of fourteen he was apprenticed to this gentleman to learn the manufacturing business, and went in the course of the following seven years through the regular course of the instruction, in combing, warping, and weaving. In the first

year of his apprenticeship he was sent round the country as far as Leiston in Suffolk, to take out the wool to the spinners who lived out of the city, and to gather in the yarn that had been spun, and pay them for it. At such times he had large sums of money with him, and it will give a very pleasing evidence of his employers' opinion of him, that he never failed to execute these commissions to their satisfaction.

"In his eighteenth year he had an attack of rheumatic fever and jaundice so severe that his life was despaired. He was, however, restored to health, but his constitution was so much impaired by it, that it was only by a strict attention to his manner of living, that he was spared so long as he was.

"During this period he continued to improve his mind, eagerly availing himself of the kind permission Mr. Herring gave him to use his library. His pursuits had assumed the peculiar feature they retained through life. He collected and cultivated flowers, and his room was adorned with curious shells, etc., which he picked up at the shops in the city.

"In his twenty-second year, from the general failure of business, Mr. Herring gave up his manufactory, and he in consequence found himself without any means of support. He at first thought of leaving England, and going to America, but a vacancy occurring in Messrs. Bignold and Co's [office],* he applied for and obtained it [in 1814]. He never had any predilection for the manufacturing business, and the situation afforded him the opportunity of pursuing his quest of knowledge in the vacant evenings."

With his entry into the office of Mr. (afterwards Sir Samuel) Bignold, the memoranda noted by my uncle cease. But to continue the record of these private incidents, I should not omit to mention that in the following year (1815) Samuel Woodward was married to Elizabeth,† daughter of Bernard Bolingbroke of this city; and from this union there resulted, in due course of time, a family of six sons, and three daughters, two of whom died in infancy.

* The Norwich Union Fire Office.

† She died in 1866.

We now find him at the age of twenty-five, and have no account of any natural history observations which he had made. Ten years later he was in the full tide of scientific work, carrying on considerable correspondence. There are few records of this interval. I am unable to say at what period his attention was first systematically given to the study of Natural History. Indeed most probably it was a gradual process of self-education, the outcome of his efforts to learn as much as he could about the miscellaneous objects then, and often even now, known under the name of "curiosities."

One of the puzzles he first endeavoured to solve was a mass of flint containing *Ananchytes*, which he had noticed on a cottage mantel-piece, where it was kept, well black-leaded, as an ornament. And one of the books which first excited his attention, and perhaps directed it to antiquarian and geological studies, was Verstegan's 'Restitution of Decayed Intelligence, in Antiquities concerning the most noble and renowned English nation,' a curious work, of which the first edition was published in 1605, and in which the former connection between England and France was then advocated.

Not only did he use every opportunity, restricted though he must have been, of adding to his stock of knowledge, but at this period he himself taught in both evening and Sunday schools, and was thereby brought into contact with Joseph John Gurney, who throughout his life, proved a true friend to him.

In the Norwich Union Fire Office he was employed until 1820, the time of an election,* when party spirit indirectly exercised a beneficial influence over his future course of life. It was at this troubled period that the clerks were told they would be required to vote for the Tory candidate; and having stated that he had always voted with the Whigs, he was informed that he had better look out for some other berth. Flushed and excited he took up his hat, and walking out, stumbled against Simon Martin, then a partner in Gurneys' Bank, who told him he was the very man he wanted to see, and begged for the promise of his vote. Having learnt what had just occurred, Mr. Martin requested his

* Richard Hanbury Gurney, of Keswick, and William Smith, of London, were then elected Members of Parliament.

attendance at the bank on the morrow, saying he would try and obtain for him a place then vacant. The appointment was duly kept, he was installed in the bank, and there he occupied a position for the remainder of his life.

By this change he was brought prominently under the notice of Hudson Gurney, of Keswick, and Dawson Turner, of Yarmouth, both Fellows of the Royal Society, and to their kindly help and encouragement he very largely owed the opportunity of prosecuting his favourite studies, and the success which attended his labours. To them he was particularly indebted for the loan of books, and for aid in his publications.

The works of Parkinson, William Smith, and later on that of Conybeare and Phillips, became his text-books, while the writings of Richard Taylor gave an impetus to his local researches. Taylor's earliest paper was published in 1822,* and in the following year my grandfather made his first tour of the coast, but, as he records, "without obtaining any specimens of fossil bones." In the spring of 1824, a friend sent him two grinders of the elephant from Mundesley, and soon after he made another excursion from Yarmouth to Cromer along the beach, and obtained some good specimens; and might, he says, have obtained some very large and fine ones, but for the difficulty of conveyance.

From this year until the time of his death he maintained a considerable correspondence with many of the leading naturalists and geologists of the day. The letters he received, together with many miscellaneous memoranda, are preserved in eleven quarto volumes in the possession of Mr. T. G. Bayfield, and to these I am largely indebted for the materials upon which my notes are now based. During this period of fourteen years he seems to have kept every scientific letter he received, consequently while many are full of information—and it must be remembered, that in those days letter-writing was, as a rule, far more elaborate and careful than it is now—yet not a few possess but the interest of autographs. Alike the seeker, and the sought, after information relating to coins, rings, seals, merchant marks, and ancient buildings, he maintained also a series of notes and queries on many

* "Fossil Bones on the Coast of East Norfolk." *Phil. Mag.*, Vol. lx., p. 132.

geological topics. Among his correspondents whose letters are preserved, the following are noteworthy:—William Bean (of Scarborough), C. W. Peach, R. C. Taylor, Hudson Gurney, Dawson Turner, the Rev. James Layton (of Catfield), Thomas Amyot (Treasurer of the Society of Antiquaries), J. W. Robberds, Miss Etheldred Benett,* Goddard Johnson, H. Denny (of Leeds), Daniel Stock (of Bungay), Dr. Buckland, Professor Sedgwick, Dr. Mantell, G. B. Baker (of Bungay), Charles König, R. I. Murchison, John Phillips, Dr. James Mitchell, William Gilbertson (of Preston), the Rev. Thomas Image (of Whepstead), the Rev. George Munford, the Rev. W. Foulger. Among short notes, valuable as autographs, may be mentioned those from Fitton, De la Beche, Lyell, Agassiz, Sir Philip Egerton, Elizabeth Fry, Harriet Martineau, and Charles Warterton.

His first letter to Mr. Caleb Rose, of Swaffham, was written in May, 1826, and from that date there was an uninterrupted correspondence, mostly on geological matters, until my grandfather's death. The enthusiasm of the two friends seems to have been great; every discovery of a new fossil was at once communicated, while books and specimens were lent, borrowed, and exchanged in a way that speaks well for the prosecution of science in those days.

In 1824, when thirty-four years of age, he made his first communication to one of the learned societies in London. This consisted of a series of Maps and Plans of Ancient Norfolk, which he submitted to the Society of Antiquaries, through Mr. Hudson Gurney. One of these was a map of the county during the Roman period, showing so far as could be ascertained, the several stations and roads; another pictured the great estuary, which it was considered had spread itself to *Venta Icenorum*, before the sands on which Yarmouth was built were left uncovered by the sea. This latter map was based on one belonging to the Corporation of Yarmouth, called the 'Hutch Map,' and which had been engraved for Ives' 'Remarks upon the Garianonum of the Romans,' with, however, many inaccuracies as to places and distances, which were now corrected. To the general accuracy of

* Well known to geologists as the authoress of *A Catalogue of the Organic Remains of the County of Wilts*, 1831.

this new map, Mr. Amyot bore personal testimony on the occasion of its exhibition in London.*

In 1825 he had already nearly completed two MS. works, one entitled 'Sketch of the Norwich Crag Deposit, with a Descriptive Catalogue of its Fossils,' a quarto volume containing twenty plates with outline figures of the species; the other, entitled 'Remarks on the Geology of the County of Norfolk,' was also bound up in quarto, and this was illustrated with coloured figures of the fossils, and with coloured sections of the strata. Both works were commenced and so far carried out on a plan that would have rendered their publication far too expensive. The projected 'Geology of Norfolk' was to comprise twenty-four plates, which when completed would contain nearly 1000 figures; he had already drawn about three hundred, and others were subsequently added: these remain as he left them. The substance of his observations, and figures of many species were, however, published in his 'Geology of Norfolk,' in 1833, to which allusion will presently be made. But I should not omit to say a word in praise of the very careful and artistic figures of the fossils, which, being drawn by one entirely self-educated, bespeak very considerable native talent.

In 1826 he was proposed by Mr. Simon Wilkin, F.L.S., as a member of the Committee of the Norfolk and Norwich Museum (founded in 1824), an office which he held at intervals during the subsequent years of his life.

On June 1st, 1827, he exhibited before the Society of Antiquaries some antiquities found in the parish of Coltishall, and which led him to conjecture that the spot whence they were obtained, had been a landing-place to the Romans navigating the Bure, in their way to Brampton or Burgh-by-Aylsham.†

Later on in the same year he was engaged with Mr. W. C. Ewing in exploring the barrows on Eaton Heath. He states, "They are four in number, and are arranged nearly in a straight

* The Maps were afterwards published, by the kindness of Mr. Hudson Gurney, in an Appendix to *The History and Antiquities of Norwich Castle.* "They were the first-fruits of his studies, and the means of introducing him to the notice of those accomplished and distinguished cultivators of archæological science, who subsequently afforded him such generous encouragement." See Preface to that Appendix, p. 45.

† *Archæologia*, Vol. xxii., 1829, p. 422.

line from so.-west to no.-east—the southernmost two are ploughed over, but the others having been planted with Scotch Firs, are a pretty object from the London road at Harford Bridge and Hill." After exploring three of them without any archæological reward, his record thus continues :—

"We then directed our attention to the fourth Barrow, and marked out a space twelve feet by six in the centre, the greatest length being east and west. At three o'clock we got to the depth of seven feet, when we came to the black ashes or mould: we now proceeded cautiously, and in a short time a patch of the green oxyde of copper was uncovered, about twelve inches in diameter. Under this was a small quantity of thin leather, probably the lining of the shield, which I consider the oxyde of copper to have been originally; and under this a fragment of wood, six inches square on the surface, and two inches thick, with a thin coating of the green copper oxyde adhering to it—these formed all that was found, as we examined the black earth carefully; no vestige of bone or pottery was seen. The section had a singular appearance, being from the lower part towards the top composed of brown patches with a light edging round, resembling courses of bricks, and nearly as regular, that we consider it must have been formed with sods of turf."

During his explorations at Eaton, he obtained eleven Celts, and a perfect Celt mould of metal, which were dug up in removing the roots of an ash tree. These were exhibited in his name by Hudson Gurney, at the Society of Antiquaries, on December 6th, 1827.*

Few memoranda exist of his private life at this time, but probably there was nothing especially deserving of record. In 1828 he was living in the Lower Close, having removed thither from Dean's Square; and in the same year he paid his first visit to London, when he was introduced to Sedgwick and Conybeare. On the 5th of February he was elected an Honorary Member of the Yorkshire Philosophical Society, at the suggestion of John Phillips, then Curator of the York Museum, with whom he frequently corresponded, and to whose charge he sent many fossils, impressions of seals, and drawings.

* *Archæologia*, Vol. xxii., 1829, p. 424.

In 1828 he addressed a letter to Dr. Fitton, President of the Geological Society of London, respecting some remarkable fossil remains found on the Norfolk coast. This was read at a meeting of the Society, held on the 2nd January in the following year. Therein he noticed the occurrence of crag at Cromer, and westward of that town, at Coltishall, and around Norwich. To the eastward of these situations, he remarked that instead of marine shells, a layer of ligneous and mammalian remains was found reposing on the chalk. In this immense numbers of the fossil remains of the elephant, horse, deer, &c., mingled with the trunks, branches, and leaves of trees, had been found, even to the distance of twenty miles out at sea; and on the knoll-sand, etc.* These observations are of interest in connection with recent discussions on the Forest Bed. In the foregoing note no definite opinion was expressed as to the occurrence of stools of trees in the position in which they grew. But this same year (1829) he communicated a short sketch of the geology of the county to the 'Norfolk Tour,' and therein states that, in what was subsequently termed the Forest Bed, there "are found a surprising number of vegetable and animal remains, as trunks, branches, leaves, and stumps of trees (*in situ*)," etc. There is nothing, however, in this or other notes I can find, to show whether or not he had himself determined that the stumps were in their natural position.† Two years previously (1827), he notes that in his collection of remains from the coast, were Elephant, Rhinoceros, Hippopotamus, Horse, *Bos*, Irish Elk, and three species of deer.‡ Many of these were obtained from the oyster-bank off Hasboro', which he regarded as "an extension of the blue clay of the cliff." He also observed at this time, that "the horns of the deer species are broken into fragments of from six to eight

* *Proc. Geol. Soc.*, Vol. i., p. 93.

† All observers admit that the Rootlet Bed furnishes evidence of a land surface with rootlets *in situ*, and it seems most probable from the evidence gathered by Mr. C. Reid, of the Geological Survey, that most of the stools of trees seen at Hasboro' belong to this horizon, beneath which the majority of the mammalian bones occur.

‡ Having submitted his list at this date to the Rev. James Layton, that gentleman replied that he could add nothing, save that he thought he had four species of deer. See Layton, *Edin. Journ. Science*, Vol. vi., p. 199.

inches in length, and three-fourths of them are shed horns, indicating that they are at present not far removed from their original locality, and confirm at the same time the tradition that this part of the sea, called the Holmes, was originally a Forest." It is interesting also to note here that, judging from a pencil drawing preserved among his papers, he was evidently aware of the peculiarity of the double curvature of the tusk of the mammoth, which was supposed not to have been noticed until 1864.*

Later on (23rd March, 1829) in another communication to Dr. Fitton, he added: "In putting my notes together of the different sections of the crag strata, I was struck with the regular occurrence of nodular flints reposing on the chalk. Wherever a section has been made in the crag strata of Norwich, with one exception, there has been found a layer of these flints, from twelve to eighteen inches in thickness, reposing on the chalk; reasoning from analogy we should say that the chalk in these instances had been subject to the action of currents of water previous to the deposition of the shells; as the appearance of the flints perfectly agrees with the like phenomena going on at Foulness point, Cromer, and at Trimmingham beach on our coast; at the latter place they are by no means so numerous, which may be accounted for from the immature state of the flints in the chalk at that place. The chalk under these flints is perforated as if by pholades." †

This year (April, 1829) he submitted to his friend Mr. Amyot some "Fragments illustrating the History of Norwich Castle," in which he pointed out the resemblance of its ornaments to those of Saxon date; thus agreeing with other writers that the building was erected before the Conquest.‡ In May he communicated some "Observations on the Round Towers of Norfolk," to the Society of Antiquaries. Having traced out their distribution on a map, he found that they were not peculiar to the line of British trackways, and were more frequent in those parts of Norfolk where

* To this my attention was called by my uncle, Henry Woodward, LL.D., F.R.S. See *Geol. Mag.*, Vol. i., p. 241, and Vol. v., p. 540.

† These notes were not published at the time, though the substance of them is given later on in his *Geology of Norfolk*. This explanation is the same as that independently arrived at by Mr. Harmer, and published about two years ago. *Quart. Journ. Geol. Soc.*, Vol. xxxiii., p. 134.

‡ See *The History and Antiquities of Norwich Castle*, p. 3.

thick diluvial gravel occurred. With one exception (West Dereham) all were built of flint boulders, and he stated his conviction, that they owed their form, not to any peculiar style, but had been built from necessity, in consequence of the absence of freestone from the soil.

At the request of Daniel Gurney, he directed his attention, in 1825, to the collecting and publishing of Merchant Marks, and two years afterwards announced his first attempt, comprising six specimens, of dates from 1409 to 1608, which he had drawn on stone. With Miss Etheldred Benett he corresponded much on the subject, and thus writes to her on the 14th February, 1829: "Merchant Marks having existed in Norwich until within the last thirty years, the antiquity of them has been lost sight of, and their history thought beneath the attention of the professed antiquary. In Norwich I have been able to go no further back in *existing* marks than that of Daniel Mayor, 1407. I have copies of some much earlier." He mentions that they were nearly contemporary with the introduction of armorial bearings, and were used by a large majority of the wealthy of England. They are found in stone on the buildings erected by the merchants, sometimes over the door as a show-board, but more frequently on the spandrills of the oak door-jambs, on the wainscotting, the stone chimney-pieces, and in the stained glass. Numbers also are found on funeral monuments. He observed that they were composed of certain mathematical figures, which might have had some allusion to the kind of merchandise imported, but which were afterwards used as export marks.

Occasional short visits to friends in various parts of Norfolk enabled him to take notes of the geological and architectural features over a large area. Thus, he sojourns with Mr. Rose at Swaffham, with the Rev. J. Layton at Catfield, with the Rev. Richard Johnson at Stalham, and with the Rev. G. R. Leathes* at Shropham Hall. It appears as if the clergy of Norfolk were in those days more devoted to science than they now are. Mr. Leathes drove him in July, 1829, from Shropham Hall to Swaffham, and he notes that on the way, "We passed Wailing or Wayland Wood, and the farm-house (on the right), which about thirty years ago,

* Mr. Leathes died in 1836.

contained the story of the Children in the Wood, both in figures and verse: the first were on the pannels of the staircase, and the latter on the chimney-piece."

His note on Musical Snails, communicated to the 'Magazine of Natural History' in 1829, refers to the sounds produced by a common garden snail in drawing itself along his window-pane.

For some time past his Synoptical Table of British Organic Remains had been in preparation, entailing much research and correspondence, and early in the year 1830, when ready for press, the manuscript was submitted by Mr. Hudson Gurney to Mr. (afterwards Sir Roderick) Murchison, then Secretary to the Geological Society. Shortly afterwards, Murchison wrote a letter to him, that consisted of no less than twenty quarto pages, giving many valuable suggestions, and pointing out many errors of omission, such as arose from the want of access to works, which is certainly not to be wondered at considering the difficulties and expenses in hunting them up in those days of stage-wagons and coaches. The tone of the letter did not, however, please him, and on the 29th March he writes as follows to Mr. Gurney:—

"Mr. Murchison has thrown a complete damper over me with his letter of five sheets, notes, &c., &c.; they contain, however, valuable information and suggestions which I hope to profit by. It bears strong traits of coming from a mineral geologist, and confirms an opinion long entertained by me, and which is ably expressed by Bakewell the Geologist, in a recent No. of the Magazine of Natural History. He says, 'there is a certain prejudice more or less prevalent among the members of scientific societies in large cities, as London and Paris, which makes them unwilling to believe that persons residing in provincial towns, or in the country can do anything important for science.'"

However, Mr. Gurney lost no time in sending him down "a cargo of geological books," he diligently set about inserting the required references, and the work was published at Mr. Gurney's expense, on the 1st July, 1830. The list of subscribers numbered 155, and among these it is interesting to notice the names of our honoured members, Mr. R. Fitch and Mr. John King.

This work is now naturally out of date: it was superseded in 1843 by the 'Catalogue of British Fossils,' by Professor Morris, the second edition of which is a work of constant reference to every

working geologist. It contained references to about 2000 species of fossils, now upwards of 13,000 are known. Nevertheless, this was the first attempt of its kind, it was the work of reference for thirteen years, and paved the way for those that succeeded it. No higher testimonies to its value could be given than that of John Phillips, who writes in 1831, "I have found your Catalogue of great service," and that of Sir Philip Egerton, writing a few years later, to forward his 'Catalogue of Fossil Fishes,' and offering assistance, if he reprinted his "most useful Table of British Organic Remains."

He subsequently embellished an interleaved copy of his 'Synoptical Table' with figures of nearly all the species, some being lithographs, but most of them pen and ink sketches which he copied from published books.

Working as he did at the bank during this period and in succeeding years, from nine in the morning until six o'clock in the evening, nearly the whole of his leisure hours were given up to science; indeed, he snatched what little time he could in the early morning, in the evening, even in his dinner hour for the pursuits he had in hand. He habitually locked himself in his study while carrying on his work, to prevent the incursions of his children. But while such a severe measure was necessary for the prosecution of his work, he, nevertheless, took great interest and pride in their occupations.

On the 16th May, 1831, he communicated to the 'Magazine of Natural History,' a short account of the *Trichiosoma lucorum*, one of the Hymenoptera, in which he mentioned the fact of his "little boy,* being very fond of prying into the manners and customs of insects," and concluded by stating that "The accompanying figure [which was engraved] is sketched by my young naturalist (now 9½ years of age), who is entirely self-taught, and I hope it may be sufficiently to your purpose to have it engraved, as it would probably induce others to direct the attention of their children to the study of nature."

He must have obtained occasional reprieves from his duties at the bank in order to carry on some of his scientific explorations, and he now and again left them at the express desire of

* My father, the late Dr. S. P. Woodward, of the British Museum.

Mr. Hudson Gurney, in order to point out and explain to friends of his, some of the many objects of antiquarian interest in the City. He rarely, however, left home for longer than a few days together: indeed, his means would not admit of it. Never did he gain sufficient of this world's goods to place him in a position of pecuniary ease. A memorandum dated July, 1827, shewed how he then had to bring his expenses within £150 a year, and at no subsequent period probably did they very largely exceed this amount. No wonder then that the struggle for existence became keen. Nevertheless, he was always ready to render assistance to others in giving information which they sought, as an acknowledgment of which he received many gifts of fossils, antiquities, and books, which added to those he obtained by the exchange of specimens, ultimately rendered his collection a very extensive and typical one. Many published papers which he could not afford to purchase, he carefully copied out.

The year 1831 was marked by the formation of the British Association for the advancement of Science, and John Phillips invites him to attend the first meeting held at York; this, however, he was unable to do. Mr. and Mrs. Murchison in their return southwards from this meeting, pay a short visit to Mr. Gurney, at Keswick, who previously writes to my grandfather, begging him "to get them in the way of seeing all they wish," as he was delayed in Town. Subsequently Mr. Murchison wrote from Snettisham, where he had broken his journey, telling him when he expected to be in Norwich, though asking him not to wait for him, "inasmuch [he said] as I travel with my own horses, and am much more frequently stopped on the road than most modern travellers."

The following year (1832) he was again in London, and went the round of the principal learned societies with Hudson Gurney; with him also he went one Sunday evening, at nine o'clock, to a conversazione at Mr. Murchison's, where he met Buckland and Lyell.

With reference to some remarks made by Sir John Byerley, on the direction of our ecclesiastical buildings, he tested twenty-four of the Norwich churches with the compass, and found them to deviate as much as 24° N., and 21° S., of E.*

* See *Mag. of Nat. Hist.*, Vol. v., p. 762.

To the Society of Antiquaries he communicated in May, 1832, a general account of Icenian Antiquities, including pottery, stone and bronze implements and weapons, querns, &c.

The year 1833 saw the publication, on the 1st May, of his 'Outline of the Geology of Norfolk,' one of the first works describing the geology of any English county, and one which in its plan and scope has not at present been superseded. Much necessarily requires remodelling in the classification and nomenclature of both the strata and their included fossils; but the work has retained its place as the standard book of reference, and was used as a basis by Dr. Barrois, when describing the Chalk of Norfolk, in his recent work on the Cretaceous strata of England and Ireland (1876). It is indeed chiefly in respect to the drift or glacial deposits that our knowledge has increased, which may be seen when we compare the careful map of Messrs. Wood and Harmer, with that attached to the 'Geology of Norfolk;' one only wishes that these authorities had given us as excellent a picture of the Geology of West Norfolk, as they have of its eastern division. Our present knowledge would not, however, enable us much to modify the divisions and boundaries of the Secondary and Tertiary strata from the Kimeridge clay to the Crag, which are depicted in this older map.

As a critique on this work, I cannot do better that quote the opinion of his friend, Dr. Mitchell (in a letter written March 6th, 1837). "Your little book on Norfolk, though most unhappily brief, has however this great merit, that what is in it we can believe, and if the author has fallen into the sin of telling a great deal less than he knows, he has avoided the hundred times greater sin of telling more than he knows."

He touched very little upon theoretical questions, although, in his theological tenets—he was "a partial conformist to the Church of England"—he was led, as were most other geologists of the time, to believe in a universal deluge. And one speculation he ventures to make known to Dr. Mantell (July, 1831), writing, "we are led by the Sacred Scriptures to believe that there will be a resurrection of our bodies, and that we shall appear in a material form. As this is to be the case, why may not the human remains of the former world have been raised in like manner?" Dr. Mantell apparently had nothing to say to this.

To return to the geology of Norfolk. In his descriptions of the Crag he notices "the apparent agreement in the gregarious habits of the original occupiers of these shells [called in those days *rejectamenta*] with the recent mollusca, confining them to particular spots or habitats." And in his remarks on chalk flints, he maintains that they, "by chemical attraction, congregated themselves into the nodular and tabular forms under which they appear." He considered their generally regular occurrence and occasional appearance in oblique veins, to be antagonistic to their animal origin; for in reference to the former, he remarked on the parallel cases of "geodes" [septaria] in the London and Kimeridge clays. At the same time the huge cylindrical flints called "Paramoudras," were included as fossil sponges, both in the 'Geology of Norfolk,' and in the 'Synoptical Table.'

No less than five hundred and twenty-seven species of fossils were enumerated from the various strata of Norfolk; of these many were new, and were named and figured by the author, although unfortunately he never published descriptions of them—a want which has prevented some of them from being adopted, for the figures were not in all cases sufficiently definite.

It would occupy too much time were I to dwell more fully upon this work, which is well known to all students of Norfolk geology. But I may add that his remarks upon the denudation of the coast, and especially his quotation of the opinion of one of our greatest geologists, that Cromer would be destroyed in about forty years, seem to have created some little consternation at the time.* Thus on July 3rd, 1833, he writes to the editor of the 'Norwich Mercury' to allay the "unnecessary alarm," and to point out a plan which he thought would remove the evil. He says: "I am disposed to think that by cutting down the cliff to form an inclined plane, the sea would run up it in high tides and gales, and deposit a layer of sand and pebbles, instead of battering them down as it does in their present state. I have lately conversed with Mr. Wm. Smith, the geologist and surveyor,† who from his long residence in

* Hudson Gurney, writing to S. Woodward (February 13th, 1824), says, "I saw Buckland also, the geologist, last night . . . . He maintains that the church and half the Town of Cromer will be in the sea in less than 40 years."

† Uncle of Prof. John Phillips, F.R.S., and known as "Strata Smith," the father of English Geology.

Norfolk must be known to many of your readers, and he fully concurs in my opinion; with this addition, that he would recommend a quantity of chingle to be spread over the new surface, in preference to planting it with the Marram grass, which he considers worse than useless. He says he recommended the same plan to be adopted with the Marram Hills and found it to answer his fullest expectations."

I might add, that this method of obliterating the sections along the coast of Norfolk, would be a very effectual way of putting an end to some of the geological disputes.

He attended the meeting of the British Association held this year (1833) at Cambridge, but did not seem altogether much gratified with his visit. As his friend, Mr. Rose, remarked in a letter dated July 4th, "authorities were ponderous," and we are "insignificant labourers." He added, "Among the authorities Mrs. Murchison ranks high, as I believe you told me, and I had an example of it; on the Friday morning, [William] Smith and myself were conversing about the Bilney shells, when up came Mr. and Mrs. M. Smith asked Mr. what the shells were, he hum'd and ha'd, and then appealed to the grey mare saying 'she knowed most about them,' and so it proved, for she *immediately* pronounced them to be *London clay fossils*. What do you think of petticoat government?"

This year was an eventful one to him, as to many others, inasmuch as Sedgwick first came to Norwich, as a canon of Norwich Cathedral.

Dr. Mantell writing from Brighton (December 14th, 1834), says: "Believe me you are most fortunate to have such a man near you: it will more than compensate for your distance from all the other savans in England. I think Mr. Sedgwick by far the most talented and splendid man we can boast of. I only wish we had a cathedral here and he had a stall in it."

During the Professor's residence in Norwich, they not unfrequently met, Sedgwick often inviting him, and occasionally coming to spend an evening looking over the treasures in his collection. A silhouette preserved among my grandfather's papers, was reduced from a tracing of Professor Sedgwick's shadow, which he took in January, 1836.*

* In his collection are silhouettes also of Wm. Bean, C. B. Rose, Dr. Mantell, Dr. J. Mitchell, and Miss Benett.

Keeping a weather diary this year (1833), it is interesting to note that there were only four rainy days in May.

He also records with pride that on October 29th, his eldest son, Bernard,* then aged seventeen, read his first paper at the Mechanics' Institution, on the subject of our British strata, to an audience of more than a hundred persons. His son for a time became a resident at East Dereham, and a letter from Mr. (now Sir James) Paget, dated Yarmouth, August 17th, 1834, encloses a list of plants which he thought it probable might be obtained near that town, adding, "I assure you that the excursion I took with your son afforded me pleasure fully equal to that which he could have received, and I shall be very glad at any time or place, to show the same attention to one so interestingly ardent and acute in the study."†

The 'Sketch of the Natural History of Yarmouth,' by C. J. and James Paget, was published in 1834, and to the introduction of that work he contributed a few geological notes.

His sons, Bernard and Samuel, about this time took notes of the dates of flowering plants for Mr. Hewett C. Watson, who gives each a copy of one of his works, in return for the records sent, saying in a letter (August 13th, 1834), "I only hope that others [lists] promised will be half as full; in which case we may arrive at a fair estimate of the climate and progress of nature in different parts of Britain, by comparisons."

About this time he removed to Grove Cottage, Lakenham, where he spent the short remainder of his days.

The notes of a visit which he paid this year to the Rev. W. T. Spurdens at North Walsham, contain some interesting memoranda which I here quote: "In the evening Mr. S. shewed me the flint arrow head from Hoxne and described the bed in which it was found, with a cart load or two more, together with about two loads of chippings, which were used to mend the roads; as were a principal part of the arrow heads, so that this spot was

* Mr. B. B. Woodward, B.A. (Lond.), F.S.A., afterwards Librarian to Her Majesty at Windsor Castle.

† One or two of the species found at Dereham are recorded by S. P. Woodward, "Flora of Central Norfolk," *Ann. and Mag. Nat. Hist.*, New Ser., Vol. vii., p. 201.

undoubtedly a manufactory of them . . . . . They were found about fifty years ago. The following is the description of the strata given by Mr. Spurdens from memory :—

		FEET	IN.
Vegetable mould		2	0
Argillaceous sand, which graduated into ...		1	6
Brickearth or stiff clay ...	8 or	9	0
Sand	2 or	3	0
Wood and vegetable matter (Hazel nuts, etc.)		2	6
In this bed the flints were found.		or 3	0
Brickearth for which the pit was worked, which burned into a red brick.			

"The two or three feet of sand above, was full of marine shells and bones. What the shells were cannot now be determined, but Mr. S. has one of the bones which is a vertebra of Plesiosaurus."

Accompanying these notes is a pencil drawing of a Palæolithic implement, seven inches long by three at its widest part.

This most nearly resembles the implement given on Plate xv. in Vol. xiii., of the 'Archæologia,' by John Frere (1797), and reproduced by Mr. John Evans in Vol. xxxviii. (1860.)

My grandfather did not appear to be acquainted with Mr. Frere's paper; but the section noted above corresponds very nearly with that printed so long previously, and adds a little further information, from which it appears that the brickearth then worked was beneath the bed yielding the implements.

On another occasion, June of this year (1834), he went to Mr. John Gunn's at Irstead, and the following note is made of the visit.*

"Thursday morning up at 6 o'clock, and went with Mr. Gunn upon the [Barton] Broad. Sailed down to the south end to look for the stump of an oak tree which lately stood on the island of peat there, but it had disappeared. There did not appear to us to have been any particular narrowing of that part of the valley (resembling a gorge) whereby the formation might be attributed to natural causes. It most probably is artificial. Mr. Gunn, sen.

* In this year he seems to have been first in correspondence with Mr. (then the Rev.) John Gunn.

says, that in the Norris MSS. it is said to have been called the Deep Fen in the time of Edward III., and may have become water by the continued cutting of the turf out of it, the consumption of which must have been great prior to the introduction of coal. In fact the borders of the Broad are an evidence of it; as they are one solid bank of Turf of considerable extent before you gain the soil or high ground. A ridge is also left in the midst of the Broad having at this time only about a foot of water upon it, marking the boundary of the Parishes of Barton and Irstead. There was no appearance of this bank of turf on the sides of the Broad extending itself into the water; but its edge appeared very clearly defined as though kept in that state by art."

This same year, in enlarging the churchyard at Wymondham, two leaden coffins were discovered, which were supposed to contain the remains of some of the family of the founder of the Abbey, William de Albini. In consequence of receiving information of this discovery, he went over, and from the nature of the operations, as well as from some singular alterations which appeared to him to have been made in the original Norman church, he suggested the propriety of laying open the foundations, towards obtaining a fair plan of this religious establishment. This he was enabled to do, and the results were brought before the Society of Antiquaries. Concerning these investigations, Mr. Daniel Gurney writes to say: "I hope as you are turned resurrection man that you are going on with your exhumations, but I think you will be stoned by the Wymondham mob if you do not take care."

In the autumn of 1834, the magistrates had determined to reface the Castle, a decision which was regretted by many, among whom were Sir Francis Palgrave, Mr. Hudson Gurney, and Lieut.-Col. Leake, with whom on one occasion he went on a tour of inspection. Numerous letters appeared in the newspapers. On the 12th August he writes to the 'Norfolk Chronicle:' "The demolition of our Castle, which has withstood the storms of nearly one thousand years (and left to itself would have continued one thousand years longer) comes daily under my observation, and I cannot refrain expressing my regret on the occasion . . . . . its beauties to the antiquary lie in the loops and arches, battered by the hands of assailants and of time—those cubes of stone, brought from the Norman coast, ere stone quarries were worked in

this country—all these associations must be sacrificed at one fell swoop, for no other purpose than that previously named . . . . . Had any of the gentlemen [those who advocate the restoration] lost a nose, how would they take the consolation of being told that their face's best feature could be restored by the Tallicotian process, aye, precisely like the original. Do you think they would feel satisfied that it was *bona fide* their original nose? . . . . . .

"CIVIS."

This evoked a poetical reply from Mr. William Mason, jun., of Necton, one of whose verses was:

"I never yet had thought to see,
Such champion on duty,
Who stoutly thus in lists maintains,
A lack of nose a beauty."

On August 13th he writes to the 'Norwich Mercury:'

". . . . . .
We must venerate its very decay, since this is but a consequence of the time through which it has endured; and, however we may desire to see its noble style of architecture perpetuated in future erections, we must at the same time deprecate the rage for utility, that would violate its solemn repose. . . . . They [who think with him] had rather see it crumble beneath the touch of time, than joined and squared and veneered, and polished, till like the Athenian vessel, it retain not an atom of its original structure. . . . . ."

In a letter subsequently addressed (Oct. 26th) to the 'Norwich Mercury,' he points out that Gurdon, King, and Wilkins have proved the architecture to be Saxon, not Norman. "That being the case, it is the only remains of the kind in the world, and consequently it is of the greatest importance to the archæologists that it is not defaced." It is perhaps needless to add, that the work of restoration was carried out.

As early as 1834 he had planned out a monograph on the Echinidæ, which occupied much of his time until his death. He made many plaster casts of rare species, duplicates of which he presented to various museums.

In February, 1835, he delivered a lecture on "The Antediluvian

Topography of Norfolk," at an evening conversazione held at the Norfolk and Norwich Museum.

About this period his health seems to have been very feeble; he was suffering from an aggravating complaint, diabetes. At times he had to give up his daily duties at the bank, and this year made his most extended tour, in the hopes of regaining his strength. As it is of interest in showing the means of travelling in those days, I give a somewhat lengthy account of it from his notes.

On Monday, July 13th, 1835, he went by packet to Yarmouth in company with his son Bernard, and Mr. Thos. G. Bayfield. The next day he went on board the "Albatross," bound for Hull. Arrived there, he sees Mr. W. H. Dykes, and Mr. John Edward Lee, the curator of the museum. Thence he proceeds to Beverley, where he had a look at the minster, and afterwards to Scarboro', where he saw Mr. Bean, also William Smith, who explained to him the cliff sections. He made sketches of Echinidæ, then leaves for York, sees John Phillips at the museum; journeys on to Leeds, and calls upon Mr. H. Denny, and afterwards to Preston, where a correspondent, Mr. Gilbertson, welcomes him. Then he proceeds to Liverpool, and the following memorandum is made:—

"Tuesday July 23. Got into an omnibus and was taken to the Railway-station, Crown Street, a few minutes before 5 o'clock. The bustle extraordinary. Fare 5/6. We entered a tunnel immediately, said to be 290 yards long. I took my seat on the outside and hind part of the third carriage of the train, which carriage consists of three bodies. On entering the tunnel we were desired to lay down on the top, which I did and was suddenly involved in total darkness, which together with the noise of the carriages, which was terrific, caused in me a horrible sensation. As I lay on my side I lifted up my hand and found I was within a few inches of the roof. We were soon enlightened by gas, the jets of which passed us in rapid succession until we emerged at Edgehill. We then passed through the Moorish arch and were pressed along by an additional engine behind up an inclined plane."

He notes the various bridges, viaducts, cuttings, and embankments, often with a minuteness that bespeaks not very rapid travelling. At last they reach the company's station at

Manchester: "The evening turned dull, and the wind being a head, the steam, dust, etc., was very annoying—a particle of iron got into my right eye and remained there two days—the swagging of the carriages was as bad to me as the paved roads—the noise in the open air so great that I could not hear my companion who sat opposite me, and when we passed under an arch it was like a crash of thunder. We passed two trains of first class, and one of the second called the 'Pig boxes,' crammed with passengers. Each carriage (1st class) consists of three bodies, and carries 20 passengers."

We may well feel thankful that even the Great Eastern Railway has improved upon this state of affairs. Subsequently he booked from Manchester to Nottingham by the Lady Nelson coach, starting at 6 a.m., and journeying through Derbyshire by Buxton and Matlock to Derby, thence to Nottingham, where he arrives just in time to get the coach to Newark, passing Southwell Minster on the way. At Newark he arrives at 7 p.m., and takes the opportunity of seeing the Castle the same evening. He left Newark at 6 o'clock next morning, and travelling by Sleaford, Lynn, and Dereham, reaches Norwich at 8 p.m.

At this period from about July 17th to August 7th there were three weeks of hot weather without rain.

In June, 1836, he was again in London seeking health, though mostly in visiting friends, and attending scientific meetings.

In September the Marquis of Northampton, well known for the attention he paid to geology, visits Grove Cottage, Lakenham, to see his collection.

About this time Mr. Joseph Prestwich (now Professor of Geology at Oxford) paid his first visit to the Thorpe Crag-pit under his guidance, and then obtained a large and fine molar of the *Elephas meridionalis*, which he gave to my grandfather, and which subsequently was placed in the Norwich Museum.

Some doubts having been thrown on the occurrence of the Mastodon in Norfolk by Robert Bakewell, he briefly records the evidence in the 'Magazine of Natural History,' and states that he himself found one fragment of a grinder at Bramerton.

In another note communicated this year to the same journal, he describes the modern formation of conglomerate at Cromer, from a specimen containing among other things a metal button, a

farthing of George IV., and the impression of an iron nail. He suggests that garden walks might be made by mixing small fragments of iron and common salt with gravel.

Though suffering much from ill health his zeal in prosecuting scientific inquiries did not cease.

On the 8th February, 1837, he writes to the Editor of the 'Norwich Mercury' about some excavations for the new factory belonging to the Norwich Yarn Company, which were on the original site of an establishment of the Carmelites or White Friars. And on the 1st March, he records in the 'Norfolk Chronicle' the finding of a Bulla of lead at this locality.

Writing to him on February 27th, 1837, Dawson Turner says: "I am much obliged to you for your interesting communication to which I should now make a return in kind, had I in the enjoyment of good health, but half the industry and energy which you retain under the pressure of sickness."

He was also busy at this time with the preparation of a "Theoretical View of the Geology of the Norfolk Coast," a MS. work which under this title is indexed in the catalogue he made of his books and fossils in 1837.

On the 3rd March he sends to Mr. Turner drawings of six corbels lately removed from the parish church of Hellesdon, "to improve its appearance," as he sarcastically remarked. These he stated much resembled the dramatic masks of Terence.

One memento of the respect in which he was held at the bank, may here be given in the following letter addressed to him :—

"Bank

"6 mo. / 24 1837.

"Esteemed Friend,

"I enclose . . . . . and £50 which my partners kindly unite with me in presenting to thee as a token of our regard and sympathy, under the circumstances of thy trying illness. . . . . .

"I am thy sincere friend

"J. J. GURNEY."

Of the several works he had in hand at this time he lived to complete none. Death removed him on the 14th January, 1838, and he was buried in the churchyard of St. Stephen's, where on

the south side* a tablet is placed, on which the following lines are inscribed :—

"IN FRONT OF THIS PORCH
LIE INTERRED
THE MORTAL REMAINS OF
SAMUEL WOODWARD,
FORMERLY OF THIS PARISH,
AND OF THE ANTIQUITIES AND THE
GEOLOGY OF THIS CITY AND COUNTY
AN INDEFATIGABLE INVESTIGATOR.

BORN 3RD OCTOBER, 1790.
DIED 14TH JANUARY, 1838.

WHATSOEVER THY HAND FINDETH
TO DO, DO IT WITH THY
MIGHT."

The only portrait of him, apart from some silhouettes in the possession of Mr. Bayfield, is a lithograph which was drawn in 1833.

Thus ended a life of devotion to science, a life whose published works form but a partial memorial of the indefatigable industry of their author. For at least twenty years he seems to have plodded on disregardless of personal relaxation and rest, making the sad mistake of only seeking them when his health rendered it absolutely necessary. We may condemn such rigorous habits, yet we cannot but applaud the devotion to science for its own sake, and admire the enthusiasm which gave him the incentive to work without prospect of pecuniary reward, ambitious only of rendering some service in the cause to which he so entirely gave himself up.

After his death, his collection was purchased by subscription for the Norwich Museum, for the benefit of his widow and family,

* This south porch is removed, and the tablet is now placed on the wall of the church.

and the following letter was addressed by Prof. Sedgwick to a committee of gentlemen interested in the affairs :—

"GENTLEMEN,

"At your request, I have examined the late Mr. Woodward's Geological Collection, and find it composed of a series of many hundred specimens, arranged in a well-filled Cabinet of forty-two drawers, besides many valuable Fossil Bones and other large unarranged specimens. Several parts of this series are extremely good. For example, the specimens of Norfolk Crag are among the best I have ever seen; and the specimens of Suffolk Crag are also excellent; many of the Chalk Fossils are very good; and the Echinites are of great interest and value, having been collected to illustrate a work by himself, which was far advanced at the time of his death. I may also mention that the drawers containing a considerable series of Ammonites, Belemnites, Crinoidea, and Secondary and Transition [Palæozoic] Fossils; a small but beautiful set of Fossils from the Paris Basin; and a very fine series of Coal Plants, chiefly derived from Newcastle and other parts of the North of England.

"Considered as a whole, the Collection does great honour to the talents and long-continued zeal of its late proprietor: and some of the best parts of the series, having been derived from this and the neighbouring Counties, have a local interest which would make them a highly valuable addition to the Norfolk and Norwich Museum. . . . . .

"Surely such an appeal would not be made in vain, when it is considered how much he effected with very slender means, and how much credit his published works have shed on his native County. I believe it is not too much to say that his life has been cut short by his devotion to science, and by his continuing (after the laborious duties of the day) to spend hours in study which ought to have been given to rest. . . . . .

"Believe me, Gentlemen,
"Your faithful Servant,
"A. SEDGWICK."

Two of the works which he had in hand during the closing years of his life, were subsequently published.

One was 'The Norfolk Topographer's Manual: being a Catalogue of the Books and Engravings hitherto published in relation to the County.' The manuscript of this work was placed in the hands of Mr. W. C. Ewing, by whom it was carefully revised and augmented before publication. In his preface he states, that the work "is published for the benefit of the Widow of Mr. Woodward—a man, who was at once most estimable in the various relations of social life; and whose unwearied industry in the devotion of his talents to the elucidation, both of the Antiquities and the Geology of his native county, is deserving of every eulogium."

"The History and Antiquities of Norwich Castle," whose original lithographed title-page bears the date 1836, was published in 1847, under the editorship of Mr. B. B. Woodward.

In his preface to this work the editor says: "I should have been glad to insert in this Preface a notice of my father's life. But the history of one who begins his course encompassed with difficulties, and, after spending his days in incessant labour, falls when little beside the outlines and commencements of undertakings is accomplished, however affecting and exciting in its moral, lacks the essential requisites of an agreeable sketch."

If in one sense I have ventured to differ from this conclusion, it is from a feeling that so much was accomplished in a comparatively short time, that however much more may have been planned out, few constitutions could have continued to withstand the strain of unremitting labour, and produce good fruit in abundance for a much longer succession of years.

I will only quote in conclusion the closing passage in this preface by my uncle:—

"His memory remains an object of reverence to his children, whose paths by his patience and toil have been made so easy and pleasant compared with his own, and of unfeigned respect to all who were acquainted with his character and his acquirements."

LIST OF WORKS BY SAMUEL WOODWARD.

1829.

1. Geology of Norfolk. In "A General History of the County of Norfolk, intended to convey all the Information of a Norfolk Tour." [By J. Chambers.] 2 vols., 8vo., 1829.
2. A Letter [to Dr. Fitton] respecting some remarkable fossil remains found near Cromer, in Norfolk. [Read Jan. 2nd.] *Proc. Geol. Soc.*, vol. i., pp. 93, 94.
3. Musical Snails. *Mag. Nat. Hist.*, vol. ii., p. 244.
4. [Notes on some Antiquities found in Norfolk.] *Archæologia*, vol. xxii., pp. 422—424.

1830.

5. On the Hydra, or Freshwater Polypus. *Mag. Nat. Hist.*, vol. iii., p. 348.
6. A Synoptical Table of British Organic Remains: in which all the edited British Fossils are systematically and stratigraphically arranged, in accordance with the views of the Geologists of the present day; and a reference given to their localities, strata, and engraved figures. 8vo. and 4to. *London and Norwich.*

1831.

7. Observations on the Round Church Towers of Norfolk; and on the materials employed in constructing the early religious buildings in that County. [Read May, 1829.] *Archæologia*, vol. xxiii., pp. 7—9.
8. A Descriptive Outline of the Roman Remains in Norfolk, accompanied by a Map of the County. [Read Dec. 1830.] *Ibid.*, pp. 358—373.
9. A Copy of an Ancient Plan of the Chalk Vaults near St. Giles' Gates, Norwich: made by John Bond, 1571; exhibited, with notes, by Mr. Samuel Woodward. *Ibid.*, pp. 411—412.

1831.

10. Natural History Collection. *Mag. Nat. Hist.*, vol. iv. p. 177.
11. Luminosity of the Sea. *Ibid.*, p. 284.
12. Ætites or Eagle Stones. *Ibid.*, p. 468.

1832.

13. *Trichiosoma lucorum*, the Pupa and Imago of, a Habitat of, and the destruction of by one of the Ichneumonidæ. *Mag. Nat. Hist.*, vol. v., pp. 85, 86.
14. Luminousness of the Sea. *Ibid.*, vol. v., pp. 302, 303.
15. Origin of the Crag Stratum of Norfolk. *Ibid.*, vol. v., pp. 544, 545.
16. Sir John Byerley's Theory of verifying Dates by calculations on the Precession of the Equinoxes. *Ibid.*, vol. v., p. 761.

1833.

17. An Outline of the Geology of Norfolk. 4to. and 8vo. Norwich.
18. The Natterjack in Norwich. *Mag. Nat. Hist.*, vol. vi., p. 457.
19. Remarkable Meteor seen from Norwich, Dec. 19th, 1832. *Ibid.*, p. 463. [Also Letter in 'East Anglian,' 1832, on this subject.]

1834.

20. Drawing of Two Steelyard Weights, one of which was found at Catton; exhibited by Mr. Samuel Woodward. [Communicated Feb. 2nd, 1832.] *Archæologia*, vol. xxv., p. 589.
21. An Account of certain Judicial Proceedings at Norwich, at the commencement of the Usurpation, copied from a Manuscript written about 1675, in the possession of Edward Steward, Esq., of Norwich. Communicated by Mr. Samuel Woodward. [April 12th, 1832.] *Ibid.*, pp. 591—594.
22. Sketch of an Ancient Sword, found in the Bed of the River Yare, at Thorpe. [Communicated Dec. 12th, 1833.] *Ibid.*, pp. 618, 619.

1835.

23. Some Remarks upon the Crag Formation of Norfolk and Suffolk. *Phil. Mag.*, Series 3., vol. vii., p. 353.

1836.

24. On the Crag Formation; in answer to Mr. Charlesworth's "Reply." *Ibid.*, vol. viii., p. 138.
25. An Account of some Discoveries made in excavating the Foundations of Wymondham Abbey, with a Plan and Description of the Religious Establishment. [Communicated Dec. 1834.] *Archæologia*, vol. xxvi., pp. 287—299. [Also Letter on this subject to Editor of 'Norwich Mercury,' dated 30th Dec., 1833.]
26. Modern Conglomerate at Cromer. *Mag. Nat. Hist.*, vol. ix., p. 47.
27. Evidence in argument that remains of *Mastodon giganteus* and *Mastodon latidens* have been found in the Tertiary Beds of Norfolk. *Ibid.*, p. 151.

1838.

28. Ancient Swords, found near Norwich. [Communicated Nov. 16th, 1837.] *Archæologia*, vol. xxvii., pp. 435—437.

1842.

29. The Norfolk Topographer's Manual: being a Catalogue of the Books and Engravings hitherto published in relation to the County. The whole revised and augmented by W. C. Ewing. 8vo. *London.*

1847.

30. The History and Antiquities of Norwich Castle. Edited by his Son [B. B. Woodward]. 4to. *London & Norwich.*

V.

ORNITHOLOGICAL NOTES FOR 1878.

By Henry Stevenson, F.L.S.

Read 25th March, 1879.

The weather at the commencement of the year was by no means favourable for either the sportsman or collector, the frosts in January, though severe at times, lasting but a day or two; the heavy snowstorms, also, on the 24th and 25th were extremely local, and the ground was soon cleared, under the influence of a rapid change to a milder temperature with a considerable rainfall.

January.

Bittern. Two Bitterns killed in the county between the 10th and 23rd were brought for sale to one of our Norwich bird-stuffers.

Shore Lark. Three specimens, but all in indifferent plumage, were shot at Blakeney about the 28th.

February.

Lesser Redpoll. During the mild damp weather at the beginning of the month very large numbers of this Redpoll frequented the fields near the city, feeding in flocks upon the ploughed lands and "layers."

Goldeneye Duck. Four fine males of this really "hard-weather" fowl were shown me on the 4th, all shot at Yarmouth in the sharp frost which prevailed during the last week in January.

Little Bustard. A female, now in the possession of Mr. H. M. Upcher, was shot at Potter Heigham on the 14th.

April.

Curious Capture of a pair of Kestrels. The Rev. Dr. Goodacre, of Wilby Rectory, in this county, informed Mr. Southwell that a pair of Kestrels which usually frequented the tower of the church were captured on the morning of the 1st of April (an ominous date for them), under the following singular circumstances :—When picked up in the churchyard both birds were found to have their wings frozen to their body-feathers, occasioned, I presume, by the drifting snow of the night before having penetrated into their roosting-place in the belfry, and so wetted their plumage that the sharp frost in the early morning fairly pinioned them, and on attempting to fly they fell to the foot of the tower, where they were secured and placed in a cage.

Supposed Golden Orioles. The Rev. H. T. Frere, writing in June, informed me that a basket maker at Diss had seen two birds in an osier carr at Palgrave (an adjacent village) which, from his description, were probably Golden Orioles. They flew up into an ash-tree as he entered the carr, were not at all wild, and their whistling notes resembled, he said, the tri-syllable note with which Mr. Frere tried to imitate the whistle of an Oriole. He described them as "like a Mavis, only yellow." They were still in the same place when he went back to the carr, about half an hour later, but were not seen after that date. This appears to have been about the end of April.

Savi's Warbler. Mr. Frere also states that about the 27th of April, when walking with his wife near a small osier-bed in his neighbourhood, they recognized the note of this species, with which they are both familiar, and after watching a few minutes they saw a bird flit along a ditch overgrown with thick herbage and settle within ten yards of them, where its Nightingale-like plumage, size, and form, confirmed their first impression. Though looked for several times after it was not seen again.

Lesser Spotted Woodpecker. An adult male of this species was shot on the 5th at Heydon, where a Great Spotted Woodpecker was also killed on the 23rd of March.

SANDERLING. An adult bird shot at Yarmouth on the 11th was still in full winter plumage, not a feather indicating the spring change of colour.

SINGULAR HABIT IN A BLACKBIRD. A cock Blackbird which had a nest this month in my neighbour's garden, used constantly, whilst his mate was sitting, to perch on a projecting part of the stone parapet of the house fronting the public road, and from thence pour forth his song, apparently as much at home in that novel situation as a Starling would be.

MAY.

MAGPIE. About the first week in May a single Magpie was seen on a fence in the Earlham fields, within a mile of the city.

WADERS KILLED IN THE "CLOSE-TIME." About the first week in this month two Avocets and a White Stork were sent up to Norwich from Yarmouth. An Avocet was seen about the same time (probably one of those killed), feeding by the margin of a brackish pool near the fishing-pier at Lowestoft, and on the 8th of June another was shot on Breydon.

MARSH HARRIER. This species, the very "*genius loci* in former days," as Richard Lubbock termed it, is not quite extinct in our Broad district as a resident. On the 9th of May, at Ranworth, one was seen by my informant to seize a duckling, about five weeks old, within a comparatively short distance of where he was standing, and no doubt, from the boldness of the swoop, the bird had a nest close by. The same bird, or its mate, was seen shortly before to carry off a Lapwing from a field in the same locality, where a labouring man was at work. Four eggs of this species were taken from a nest in that neighbourhood earlier in the season.

OSPREYS. An Osprey was shot at Gimingham, in this county, on the 2nd of May, and on the 13th an adult female, at the Hempstead ponds, near Holt. On the 19th another was seen in the same locality, and again on the 25th and 26th.

LITTLE WOODPECKER. One shot near Diss about the last week in this month.

JUNE.

OSPREY. About the first week in this month an Osprey was shot from the moat surrounding the Hall at Hunstanton, near Lynn, not only an unusual locality for this wild species, but an unusual date for its appearance.

MORE "SCHEDULED" WADERS THAT DON'T BELIEVE IN THE ACT. Three Spoonbills, all male birds, with good crests and light buffy tints on the neck, were killed at Yarmouth between the 1st and 11th of June.

AUGUST.

MIGRATORY WADERS. A Turnstone in full breeding plumage, was seen on the 5th by Mr. T. W. Cremer, at his pond at Beeston, and on the 9th he observed at the same spot a flock consisting of one Wood Sandpiper *(Totanus glareola)*, five Green Sandpipers *(T. ochropus)*, and from forty to fifty Common Sandpipers *(T. hypoleucus)*. A female Greenshank, a bird of the year, was also shot at a pond at Rackheath, near Norwich, on the 10th.

MANX SHEARWATER. On the 15th an adult male, very fat and exhausted, was picked up alive at Shottesham, quite an inland locality.

TUFTED DUCK. A young female of this species, evidently a bird of the year, was shot on the river at Keswick, near Norwich, on the 17th August, and most probably, judging by the date, had been bred in this county.

MAGPIE. A single bird seen at Northrepps on the 20th.

NESTING OF SWALLOWS AND HOUSE MARTINS. The cause of the diminished numbers of both these species, of late years, in many localities, has been a theme for speculation with various naturalists; but so far as our cities and small country towns are concerned,—and even villages of any extent and importance as to residents' houses,—one chief cause of disturbance, and even banishment, may undoubtedly be traced to the marked alteration in street architecture. I have been led to this conclusion by noticing in this quaint old city the great difference in the numbers of Swallows and Martins during the breeding season, observed in its best

thoroughfares and its less fashionable localities. Wherever the time-honoured wooden gables give place to the square roof and the iron gutter, the House Martin retires to less pretentious dwellings; and where—so generally the case now—chimney-pots take the place of the large open chimney-shaft, the Swallow deserts its long-accustomed haunts, or, as I remarked in several instances this year, builds under the eaves of the houses like the House Martin, fixing its nest close up to the brickwork, as it would to a cross-beam in a barn-roof or the rafters of a boat-house. I should scarcely have noticed that these were Swallows' and not Martins' nests had I not seen the old birds hovering up under the eaves, and feeding their young as they appeared at the tiny aperture. The early congregating of House Martins with an evidently migratory intention, which I recorded ('Zool.' 1878, p. 45) as occurring on August 16th, 1877, was witnessed in exactly a similar manner in 1878, on the 7th. At 7 a.m. the lofty slated roof of the chapel opposite my house was covered with these birds, and difficult as it was to estimate their numbers, from their restlessness, I satisfactorily counted over two hundred, sitting in rows of thirty or forty together, on the roof, the stone copings, the eaves, and level ridge of the roof itself; all of these swarming on the sunny side of the building, and occasionally flying off in large flocks and settling again. I was obliged to leave home at 10 a.m., but even by that time the main body had disappeared, and only a few, comparatively speaking, were seen in the neighbourhood after that date. These I presume are the parents and offspring, whose nests, built early in the season, have met with no disasters, and who thus, freed from the anxieties of a second hatch, annually pass southward by short stages, influenced only by the weather.

November.

Woodcocks near the City. A Woodcock was flushed from my neighbour's garden on Unthanks Road, on the 2nd of November, within five minutes' walk of Norwich market-place. In June, 1877, one was caught alive in a greenhouse on the Newmarket Road, within a mile of the city.

Little Auks. Several of these birds were picked up in inland localities during the first week in the month, the wind, at times,

being strong from the N. and N.E. Between the 5th and 7th a birdstuffer at Holt had six from neighbouring localities, picked up dead or exhausted close to the coast, and far inland; about the same time one was picked up at Hevingham, another at Sprowston, and another at Syderstone on the 2nd. There is also a record in 'The Field' of November 23rd of a Little Auk picked up alive near Norwich on the 9th, but which died soon after.

Waxwings. A flock of five or six Waxwings are said to have been seen at Southwold, near Lowestoft, on the 9th of this month, and though appearing in the county of Suffolk, I record the fact here, as I learn from Mr. Anthony Hamond, of Westacre, that he has reason to believe some Waxwings occurred in his neighbourhood, in West Norfolk; but I have seen no specimens in our birdstuffers' hands.

Long-tailed Duck. Mr. Cremer, of Beeston, had a young bird of this species killed on that part of the coast about the 26th, and heard of others seen. A female was sent to Norwich Market about the 5th of November.

Black-headed Bunting, variety. A curiously pied specimen of this bird was shot somewhere in the county this month—a species not much given to variation in plumage.

Kingfishers and the Floods. Amongst the minor incidents of the floods which in November, 1878, caused so much destruction to property in and around Norwich, was the novel appearance of many Kingfishers within the bounds of the city, driven by the rising waters from their usual quiet haunts on the Yare and Wensum. For some days prior to the great inundation of the 20th of November they, no doubt, suffered privation from the difficulty of procuring food, every stream being more or less turbid and swollen, and the powerful current in the main rivers carrying everything seawards. When the final catastrophe therefore happened, on the 20th, and the waters above the New Mills, meeting with serious obstructions, diverted their course and deluged a large portion of the low-lying parts of the city, these birds, driven from one foothold to another, as the waters rose higher and higher, found at last a temporary resting-place on the roofs and upper window-sills of the houses abutting on the river. Most of these,

it is to be feared, died from want of nourishment, or, falling into the water from exhaustion, were drowned, as was actually witnessed in one instance at Carrow. In this case, the bird was seen to alight, again and again, upon any projecting branch or rail above the rushing waters, and as one after another of these became submerged it still pursued its course down stream till, at last, scared and exhausted, it fell backwards with a sharp cry, and was swept away by the torrent. One birdstuffer, alone, in Norwich had about twenty brought to him during the month of November, and chiefly in the week of the floods.

December.

Little Auks. One was brought into Norwich to be stuffed on the 3rd, and on the 16th another was picked up at Salthouse, and a third at Northrepps on the 18th.

Puffins. Two birds of this species were sent up to Norwich on the 4th of December.

Stonechats in Winter. On the 7th of December a birdcatcher brought me a young male Stonechat alive, but which lived only a day or two in my aviary and I saw two, in exactly similar plumage, in a birdstuffer's shop on the 19th of the same month.

Large Arrivals of Fieldfares and Redwings. A very unusual number of Redwings were observed at Overstrand and Northrepps, and a good many Fieldfares on the 10th and 11th of December and between the 18th and 20th, through the severity of the weather, both Redwings and Fieldfares, but particularly the latter, appeared in considerable numbers in and around Norwich,—indeed in most parts of the county,—devouring every berry they could find, and eating their way southwards when such food failed them here. The main body had passed on by the 21st, leaving only, like an army in retreat, the wounded and sick behind, most of which were either stoned by the boys or died from exhaustion in a shocking state of emaciation.

Crossbill. I saw a single red male Crossbill, killed about the 18th.

Hawfinches. During this month I was shewn some nine or ten specimens killed in different parts of the county.

Bramblings, Siskins, and Redpolls. The severe weather towards the end of the month did not bring us the usual flocks of Bramblings, and it was not till the 21st that I could get a cock bird for my aviary, though they were plentiful enough after Christmas. Siskins were numerous, but I have heard of no Mealy Redpolls this Winter.

White-eyed Pochard. A bird of this species, shot at Yarmouth towards the end of December, is the only duck worth special notice that I have heard of on our coast this winter.

Purple Heron. An immature bird of this species was, I am informed, shot in the neighbourhood of Yarmouth, and brought to a game dealer in that town between the 14th and 21st of December.

Raptorial Migrants. On the 11th of May a female Hobby, assuming adult plumage, probably a bird of 1877, was shot at Northrepps; and another was seen in the same locality on the 15th. A Honey Buzzard was seen on the 25th of September in the "Cottage Wood" at Northrepps. An immature Peregrine was killed at Shotesham on the 9th of November, and a fine adult male in the same locality on the 30th, on which date a Hen Harrier, female, was also brought into Norwich. A Merlin was shot at Knapton, near Cromer, about the 24th. On the 10th of December a Buzzard was seen at Northrepps (mobbed by Rooks), but not near enough to ascertain the species. One of the many so-called "Golden Eagles," but only *A. albicilla* in immature plumage, was shot at Fritton, near Lowestoft, about the end of December, and being but slightly wounded was captured and placed in the Yarmouth Aquarium, where I believe it still remains. Another was said to have been seen at the time on the same water, attracted as usual by the fowl frequenting the Fritton Decoy. This bird, as a "Scotch" Eagle and a "Golden" Eagle, was recorded in various London Journals. During the severe weather towards the close of December, two Hen Harriers are said to have been shot off a tree near Yarmouth, and a Marsh Harrier and a Merlin were killed in the same neighbourhood. A Short-eared Owl was shot in Feltwell Fen on the 2nd of September, as recorded by Mr. F. Doggett in 'The Field.'

VI.

NOTES ON THE METEOROLOGICAL OBSERVATIONS

Recorded at Norwich during the year 1878.

By John Quinton, Jun., Assistant-Secretary,

Registrar to the Norwich Meteorological Society.

Read 25th March, 1879.

January.

The year commenced with cloudy gloomy weather, and a very remarkably thick fog in the evening and night of the 2nd. The first three weeks, with the exception of the 9th, 10th, 11th, and 12th, were unusually mild, but the sky was generally overcast. The barometer readings decreased from 30.189 on the 5th, to 29.443 at 3 p.m. the 7th, with light W. winds; but early on the 8th the wind veered to N. and the readings increased to 30.630 at 9 p.m. the 11th. Strong W.S.W. gales prevailed on the 14th and 16th: the velocity of the wind was 303 miles on the 14th, and 317 miles on the 16th, but no unusual barometric variation occurred. The barometer fell from 30.476 on the 19th, to 29.854 on the 21st, attended by a very strong S.W. gale on the 21st; the total velocity in the 24 hours was 426 miles. At 6 a.m. the 22nd the wind veered to N.W., and the barometer rose about 2-10ths; at noon the wind veered to E., the barometer again falling, and at 6 p.m. the wind veered to S.W., and was followed by another strong S.W. gale, which lasted until 9 a.m. the 24th; the total velocity on the 23rd and 24th was 400 and 299 miles. The barometer rose slightly on the 24th, but again fell to 29.256 at 9 a.m. the 25th, followed by a W.N.W. gale. The temperature fell very quickly from the 21st to the 25th; the maximum on the 21st was 56.5, but on the 25th the highest was only 33.5, followed by a night

OGICAL REGISTER.

1877—78.	Mean Temperature.	Rain.	No. of days on which it fell.	WIND. Direction. N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Mean daily Velocity.
WINTER.	°	In.										Miles.
December, 1877 ...	40.4	2.19	15	2	2	0	4	5	7	8	3	152
January, 1878.....	40.0	1.69	16	4	1	0	3	1	7	13	2	178
February, 1878 ...	42.5	1.11	8	1	1	0	3	5	11	2	5	146
Dec. 1877 to Feb.	41.0	4.99	39	7	4	0	10	11	25	23	10	159
Eight preceding W	38.3	6.03	42	5.6	5.1	10.2	8.3	20.1	17.2	15.9	7.6	187
SPRING.												
March, 1878	41.8	0.65	16	2	2	0	0	0	7	9	11	239
April, 1878	47.5	1.03	8	3	0	13	3	4	7	0	0	191
May, 1878	54.3	3.40	19	2	1	6	2	10	6	4	0	192
March to May,	47.9	5.08	43	7	3	19	5	14	20	13	11	207
Eight preceding Sp	45.5	4.43	35	14	9	12.1	8.6	7.9	13.8	13.5	13.1	191
SUMMER.												
June, 1878	59.4	1.26	11	1	1	6	4	7	6	1	4	157
July, 1878	61.8	0.51	6	4	5	1	1	0	3	8	9	166
August, 1878	63.3	5.35	16	1	4	8	3	4	9	2	0	163
June to August,	61.5	7.12	33	6	10	15	8	11	18	11	13	162
Eight precdng. Sum	60.1	6.45	34	9.7	7.5	10.9	6.9	12.5	17.7	17.3	9.5	170
AUTUMN.												
September, 1878	56.9	2.32	13	2	1	1	2	3	11	9	1	156
October, 1878.....	51.3	1.68	15	0	0	3	4	6	11	7	0	169
November, 1878...	40.8	4.97	22	3	4	1	1	1	5	9	6	195
Sept. to Nov.,	49.7	8.97	50	5	5	5	7	10	27	25	7	173
Eight precdng. Au	49.1	7.74	44	5.7	6	9.7	8.6	18.4	18	14.4	10.2	171

temperature of 27.0. A little snow fell on the morning of the 25th, and the remaining days were cold, cloudy, and showery; winds, chiefly W.N.W. Rain fell on the 28th from 1 a.m. to 2 p.m., but only amounted to 0.38 in.; the total fall for the month was 0.12 in. deficient.

February.

The most remarkable feature in this month was the high barometric pressure; the readings fell below 30 in. on only six days, and for five consecutive days, the 4th to the 8th were above 30.500; the mean pressure exceeded the average by 0.300 in. No unusual variation was recorded, the most sudden fall being from 30.584 at 9 a.m. the 8th, to 29.939 at 3 p.m. the 10th. The weather was, with few exceptions, cloudy and gloomy, with very light winds from the N.W. during the first week, and mostly from the S.W. and S. during the remainder of the month. The mean temperature was 4.3 above the average; this excess occurred chiefly in the last fortnight, which averaged the unusually high temperature of 46.9; the mean temperature of the first fourteen days was 39.0. Rain fell on only eight days, and was 0.29 in. below the average of the last thirty-seven years.

The mean barometric pressure for the three winter months, December, January, February, was 0.218 in. above the average.

March.

The mild weather which prevailed during the last fortnight of February continued until the 13th of March, the first of the month being remarkable for the high temperature of 58.8. The barometer readings increased from 29.523 at 9 p.m. the 1st, to 30.502 at 9 a.m. the 4th, attended by fine weather, and light W. and S.W. winds. Strong gales were recorded on the 6th, 7th, and 8th, attended by the following barometric variations: the readings fell quickly in the night of the 5th, from 30.298 at 9 p.m. the 5th, to 29.923 at 9 a.m. the 6th, and to 29.741 at 3 p.m., with a strong gale from the S.W. and W.S.W. from 7 a.m. to 1 p.m., and from the W. from 1 p.m. to 10 p.m., the total velocity being 297 miles in the 15 hours. At 9 a.m. the 7th the barometer had risen to

29.980, but again fell to 29.684 at 9 p.m. the 7th, followed by a rise to 30.048 at 9 p.m. the 8th. A strong W.S.W. and W. gale was recorded from 2 p.m. the 7th to 9 a.m. the 8th, and from W.N.W. from 9 a.m. to 2 p.m.; the total velocity for the 24 hours ending 2 p.m. the 8th was 537 miles; the greatest force of the storm was from midnight to 2 a.m. the 8th, when the hourly velocity was 31 and 29 miles. This was succeeded by cold, gloomy weather, the winds chiefly N.W., and a general though slightly broken rise in the barometer to 30.664 on the 16th, followed by a fall to 30.179 on the 18th. The 19th, 20th, and 21st, were mild days, with W. winds, and the unusual high minima temperatures of 46.0, 45.0, and 44.0. During the last ten days very considerable variation was recorded in the barometer, the weather was much colder, cloudy, and frequent showers of snow, sleet, and hail were recorded. The barometer fell from 30.254 at 9 a.m. the 21st to 29.544 at 9 a.m. the 24th, followed by a further fall to 29.419 at 3 p.m.; at 4.30 p.m. the 24th, a slight, but very sudden squall occurred, the velocity of the wind from 4.0 to 4.30 p.m. was only 4 miles, the direction S.W.; at 4.30 precisely the wind veered to W., and the velocity in next 30 minutes was 8 miles, in the following hour it was only 10 miles from the W. and W.S.W. The barometric pressure which at 9 p.m. the 24th registered 29.395 rose quickly to 30 inches on the 26th, followed by a fall to 29.195 at 9 a.m. the 30th, attended by a strong gale on the 29th and 30th from the N.E. from 1 a.m. the 29th to noon, when it backed to N.N.E., at 5 p.m. it had backed to N., and early on the 30th to N.N.W.; the total velocity was 492 on the 29th, and 420 on the 30th. The barometer rose to 29.429 at 9 a.m. the 31st, but again fell to 29.193 at 9 p.m.; rain fell in the evening, followed by snow at 9 p.m., which was succeeded by a sharp frost in the night, the thermometer falling to 7 degrees below freezing. The rainfall was 0.89 in. deficient.

April.

The unusually low minimum temperature of 25.0 which was recorded early on the first, was followed by a month of mild, bright, and very dry weather, with a preponderance of easterly winds; the minima temperatures mostly above 40.0, and only one night of

frost was recorded. The barometric pressure which recorded the minimum, 29.076 at 3 p.m. the 1st, increased to the maximum 30.266 at 9 a.m. the 7th, attended by W.S.W. and S.W. winds, and a thunderstorm with hail at 2.45 p.m. the 5th. From the 7th to the 12th the barometric pressure was very steady at about 30 in.; E. and E.N.E. winds prevailed, and the velocity on the 8th and 10th was 370 and 338 miles. From the 12th until the end of the month the barometer readings were mostly slightly below the average; no unusual variation was recorded, the chief, being a gradual rise from 29.649 on the 24th to 30.241 on the 27th, with N. winds and a daily velocity of 364 and 322 miles on the 25th and 26th; this was followed by a fall to 29.616 on the 30th, with light E. and E.S.E. winds. Much lightning without thunder was recorded at 10 p.m. the 22nd, and between 9 and 10 p.m. on the 30th. The mean temperature of the month was about 1.6 degrees above the average. The rainfall was again deficient, being 0.53 in. below the average.

May.

This month was unusually wet, the rainfall being 1.55 in. above the average of this month in the last thirty-seven years, and the largest amount recorded since 1854. The mean temperature of the month was about 4.5 degrees above the usual average, but very great variation was recorded, especially in the day temperatures. On the 2nd with a light S.E. wind the maximum was 72.2, but from the 6th to the 10th, easterly winds prevailed, and the maximum on the 8th and 9th was only 52.0 and 53.2; rain fell from 8.30 a.m. to 3 p.m. on the 7th, from 8 a.m. to 3 p.m. on the 8th, and from 6 a.m. to 10 p.m. on the 9th, amounting to an inch-and-a-half in the three days. This was succeeded by light S. winds, and a maximum temperature of 72.0 on the 12th, and 74.5 on the 18th; on the 18th a thunderstorm occurred at 7.30 a.m. and another at 3.30 p.m. with heavy rain. A rather strong S.W. gale prevailed on the 19th, and during the remainder of the month, gloomy weather with light variable winds and slight showers of rain was recorded: the maximum temperature on the 21st was only 52.0. The mean barometric pressure was 2-10ths below the usual value: no remarkable variation was recorded.

June.

The mean temperature of the first twenty days of June was only 57.0; the sky was generally overcast and cloudy, weather gloomy and frequent slight showers of rain were recorded. A thunderstorm with heavy rain occurred at 2 p.m. on the 4th. Frequent oscillation was recorded in the barometric pressure, but no remarkable variation occurred; the principal fall was from 30.145 at 9 a.m. the 7th, to 29.506 at 9 p.m. the 9th, followed by a slight rise on the 10th, which was succeeded by another fall to 29.461 at 9 p.m. the 11th, and attended by squally S.W. and S.S.E. winds on the 10th and 11th. The last ten days were very fine and excessively hot, the day temperatures averaging 80.2, and the night temperatures 58.7; the unusually high temperatures of 82.5, 81.8, 86.0, and 87.0, were recorded on the 24th and three following days. The barometric pressure was very steady, the readings oscillating very slightly at 30 in., and the winds mostly light from the S.S.E. and E. The rainfall for the month was half-an-inch deficient. The total fall for the six months, January to June, was 9.14 ins., being 0.79 in. below the average.

July.

The rainfall for this month was unusually small, only amounting to 0.51 in., 1.95 in. less than the average of the last 37 years, and the smallest amount recorded in July since 1847. The weather during the first sixteen days was generally cloudy and dull, the mean day temperature only averaging 68.8; the winds were light, chiefly from the N.W. and W. The 17th, 18th, 19th, and 20th, were very fine hot days with maxima temperatures of 82.2, 83.5, 82.0, and 81.2. The remaining days were rather showery, the sky generally overcast; a thunderstorm occurred at 2.30 a.m. the 23rd, and lightning without thunder at 10 p.m. The mean monthly barometric pressure was about 0.100 in. above the average. No unusual variation was recorded; the pressure during the first three weeks was very steady. The reading fell from 30 in. at 9 a.m. the 23rd, to 29.632 at 3 p.m. the 25th, followed by a gradual rise to 30.381 at 9 p.m. the 31st, with heavy rain at 1 p.m. the 27th, and rain from noon to 3 p.m. the 29th, and a N.N.W. gale of 340 miles on the 30th.

August.

The rainfall this month was greater than has been recorded in August during the last 37 years; the total fall, 5.35 ins., exceeded the average by 2.19 ins. The showers were mostly very heavy, occurring with slight thunderstorms; half-an-inch of rain fell between 8.30 and 9.0 a.m. on the 25th, and 0.60 in. fell in half-an-hour between 1.15 and 1.45 p.m. on the 27th. No unusual variation was recorded in the barometer; the winds were light and variable, chiefly from the S. and S.W. from the 12th to 18th, and E. and N.E. from the 19th to the 24th. The mean temperature was about 2 degrees above the usual average.

Note.—No observations of the barometer and thermometers were recorded between the 10th and 25th; the average of the barometric pressure and the temperature are taken from readings on the 15 days, the 1st to the 9th, and the 26th to the 31st.

September.

During the first fortnight the barometric pressure was very steady, the readings being generally slightly above 30 in.; the winds were light and variable, and the weather mostly fine, rain falling on only the 5th, 8th, and 12th. From the 15th to the end of the month, considerable oscillation was recorded in the barometer, but no very remarkable variation occurred; the weather was cloudy, gloomy, and showery, winds chiefly from the S.W. and W.S.W. The barometer fell from 29.969 at 9 p.m. the 14th, to 29.415 at 9 p.m. the 15th, followed by a rise to 29.929 at 9 p.m. the 16th, and attended by a sudden shower of rain at 10.20 p.m. the 15th, followed by a strong W.S.W. and W. gale until 6 p.m. the 16th. The barometer fell from 30.141 at 9 p.m. the 21st, to 29.441 at 3 p.m. the 23rd; this fall was attended by a heavy shower of rain at 6 a.m. the 23rd, and followed by a gradual rise to 29.713 at 9 p.m. the 24th, with rain from 8 a.m. to 3 p.m. on the 24th. The barometer readings increased to 30 in. on the 27th, remained steady until the night of the 29th, when a further fall to 29.577 at 9 a.m. the 30th was recorded, with a shower of 0.49 in. of rain early on the 30th. The rainfall for the month was 0.04 in. above the average.

October.

The weather during the first fortnight was generally fine and mild, with a few slight showers of rain; the winds were mostly light from the S.W. and S., and a gradual fall in the barometric pressure was recorded from 30.329 on the 2nd, to 29.416 on the 8th, followed by a slight rise to 29.620 at 9 a.m. the 9th. This was succeeded by a further fall to 29.241 at 9 a.m. the 10th, attended by a S.S.E. and S.S.W. gale on the 10th, and followed by a rapid rise to 30.303 on the 12th. The weather during the last fortnight was generally cloudy and gloomy, with slight showers of rain and considerable barometric variation, all the readings being below 30 in. The readings decreased from 29.818 at 9 a.m. the 20th, to 29.206 at 9 p.m. the 21st, increased to 29.564 at 9 p.m. the 23rd, but fell quickly to the unusually low reading of 28.953 at 1 p.m. the 24th. At 1.30 p.m., the 24th, the wind veered from S.S.E. to S.W., and a strong gale was recorded from 1 to 3 p.m., the barometer rising to 29.277 at 9 p.m. Another fall to 29.008 at 3 p.m. the 26th, was followed by a rise to 29.626 at 9 p.m. the 27th, and slight oscillations were recorded during the remaining days. A little snow fell on the morning of the 30th. The mean temperature was about two degrees above the average. The mean barometric pressure was about 0.100 in. below the average. The rainfall was 0.99 in. deficient.

November.

This month was remarkable for the excessive rainfall and great barometric variations, and will long be remembered by the terrible flood which occurred on the 16th and 17th, caused by the overflow of the river Wensum above the New Mills. A very large area, especially in the neighbourhood of Heigham, St. Martin's and St. Miles', was under water, in some parts six and seven feet deep; and hundreds of houses were rendered tenantless. By a register kept at the New Mills it is stated that no flood had reached so great a height since 1646. The rainfall was 2.63 ins. above the average, and has only been twice slightly exceeded in November, in the last 37 years. The total fall was 4.97 ins.; this amount however was greatly exceeded at several places in the neighbourhood, 8.40 ins. being registered at Thorpe, and 8.13 ins. at Drayton.

The rainfall was heavy over all the county; the smallest amounts were 4.48 ins. at Wereham, and 5.10 ins. at West Tofts. Rain fell on every day from the 1st to the 17th, the winds were N.W., W., and S.W., and considerable barometric variation was recorded. The pressure decreased from 29.730 at 9 p.m. the 7th, to 29.308 at 3 p.m. the 8th, followed by a heavy rain in the evening and a strong N.W. gale from 8 p.m. to midnight; the velocity in the four hours was 127 miles. This was succeeded by a very rapid rise in the barometer, 30.156 being recorded at 3 p.m. the 9th. A deep barometric depression passing over Scotland on the 10th, caused the barometer to fall very rapidly, and 29.166 was recorded at 3 p.m. the 10th, a fall of 0.893 in 18 hours, attended by a S. and S.W. gale of 330 miles in the 24 hours. The barometric pressure oscillated slightly at about 29.400 during the next four days, which were very cold and wet; a heavy fall of snow occurred on the morning of the 12th, and the maximum temperature on that day was only 36.0. On the 15th and 16th a deep depression off the coast of Holland caused the barometer to again fall, and the unusually low reading of 28.941 was recorded at 3 p.m. the 15th. This barometric depression was attended by a rapid thaw, with much rain and strong N.W. and W. gales; the velocity of the wind on the 15th was 369 miles, and on the 16th, 319 miles. This was succeeded by a quick rise in the barometer to 30.474 on the 19th; no rain fell from the 18th to the 23rd, light N.E. winds prevailed, and the weather was cold and gloomy. The barometer fell gradually to 29.320 on the 25th, remained low until the 27th, after which a quick rise to 29.990 on the 30th was recorded, attended by a strong N. gale on the 28th, and a slight decrease of temperature, the maximum on the 30th being only 39.0.

December.

The mean temperature of the first week was 37.0, and the weather cold and gloomy, with slight showers of rain, snow, and sleet. This was succeeded by unusually severe weather from the 8th to the 25th; the mean temperature of these 18 days was only 27.6, frosts were recorded every night, and on seven days, the 9th, 12th, 13th, 16th, 20th, 23rd, and 24th, the temperature was below freezing the whole day; on the 13th, the maximum temperature

was 5 degrees below freezing. A gradual fall in the barometric pressure was recorded from 29.864 on the 10th, to 29.093 on the 19th, followed by a rise to 29.742 on the 21st, and a further rise from 29.706 on the 22nd, to 30.356 at 9 p.m. the 24th; frequent slight showers of snow were recorded, and the winds were very calm, chiefly from W.S.W. and W.N.W. A sudden fall in the barometric pressure from 30.356 at 9 p.m. the 24th, to 29.481 at 9 a.m. the 26th, was attended by a very sudden change in the temperature from frost to thaw; early on the 25th the thermometer recorded only 16.0, but at 9 p.m. the 26th, it registered 41.0, and increased rapidly, the high maximum of 54.0 being recorded on the 30th, followed by the remarkably high minimum of 48.0 in the following night. The barometer during the last six days oscillated slightly at about 29.500: the weather was very gloomy, with frequent slight showers of rain, and a strong W.S.W. gale on the 31st. The mean barometric pressure was about 0.200 in. deficient, and the rainfall was half-an-inch below the average. The mean temperature of the month was about 5.5 degrees below the average. Mr. Glaisher states that at Greenwich, during the last 100 years, there have only been ten instances when the mean temperature of December was so low as that in 1878.

The total rainfall for the year was 25.44 ins., being 1.55 in. above the average of the last 37 years.

VII.

MISCELLANEOUS NOTES AND OBSERVATIONS.

MAMMALIA.

PINE MARTEN (*Martes abietum*, Ray). On the 9th of July, 1878, Mr. T. E. Gunn showed me a beautiful male Pine Marten which had been brought to him in the flesh. Mr. Frank Norgate took great pains to ascertain the history of this specimen, and from him I subsequently learned that it was trapped by a man named Wilmot in a fir plantation at Hevingham Marl Pit. Mr. Norgate did not succeed in seeing Wilmot, but his wife said that she saw her husband leading the beast home in the trap, and that it was "sweet, clean, quite uninjured by the trap," and trotted along quietly; he also saw several other persons who had seen it alive or dead, by some of whom it was spoken of as a "big polecat," by others as a "fox cub," nobody seeming to have any idea as to what it really was. Wilmot killed the Marten and sold it to Samuel Howard, of the Marsham Arms, who took it to Mr. Gunn. A letter inserted in all the local papers failed to elicit anything with regard to this interesting occurrence; it seems, however, highly improbable that after having been lost sight of for fifty years in this district, it should have occurred in a state of nature.—T. SOUTHWELL.

PILOT WHALE. On the night of January 29th, 1879, a dead female Pilot Whale *(Globicephalus melas)* was washed on shore about one mile north of Mundesley. The stranding of a dead cetacean, which has perhaps been drifted hither and thither by winds and currents, constitutes in itself a very slight title to a place in a local Fauna, but as this species has been found as far south as the Mediterranean, it is only reasonable to suppose it occasionally passes our shores, although it has not actually been obtained alive. The list of Norfolk Cetacea with this addition will be increased to ten species.—T. SOUTHWELL.

NATURAL HISTORY NOTES FROM CHURCHWARDENS' ACCOUNTS. The parish accounts of Northrepps for the earlier part of the 18th century contain many rewards for the killing of foxes, badgers, polecats, and jackdaws. The reward paid per head being 1s. for foxes and badgers, 2d. for polecats, and 1d. for jackdaws.

The following summary shows the numbers killed in the parish in each of the years mentioned in the town book still existing as those in which such rewards were paid :—

1729.—	Foxes	9
	Badgers	2
	Polecats	5
1730.—	Foxes	5
	Badgers	1
1731.—	Foxes	10
	Badgers	3
	Jackdaws	18
1732.—	Fox	1
	Badgers	2
	Foxes and Badgers, not distinguished how many of each	16
	Jackdaws	24
1733.—	Badgers	2
1737.—	Fox	1
	Badger	1
1739.—	Foxes	7
	Badger	1
1741.—	Fox	1

After which date this class of entries ceased.—J. H. GURNEY, 11th December, 1878.

BIRDS, ETC.

BUSTARD. The following extract is from a letter addressed by Mr. J. S. Futter to Samuel Woodward, dated Watton, 24th May, 1829.—H. B. WOODWARD.

"I was the other day at Eriswell where I saw a hen Bustard which the keeper had taken in a rabbit trap alive. The bird has lost one foot and an eye, but will I think make a good specimen should your Museum directors wish to purchase it," &c.

[The history of this specimen is very curious and complete, the above extract supplying the only information hitherto wanting, viz., the exact date of its capture. No notice seems to have been taken by the Museum authorities of Mr. Futter's communication, and as ascertained by Professor Newton from Gathercole, the warrener at Wangford (who trapped the bird at Eriswell), it was stuffed by Bilson, gamekeeper to Lord Bristol, at Ickworth. In October, 1840, however (as shown by the presentation book), it was purchased by subscription for the Norwich Museum of Bilson's son, then a birdstuffer at Bury, and remained in the collection until a fine pair from Mr. Scale's collection were

presented by Mr. Gurney. It was then exchanged for other birds with Mr. W. E. Cator, at that time an undergraduate at Cambridge, from whom it passed to Mr. A. F. Sealy, at the sale of whose collection it was purchased by the Rev. C. J. Lucas, of Burgh, in whose collection it still remains. Mr. Stevenson was at great pains to trace the history of this bird, and from the manner in which one leg had been mended, as well as other peculiarities, both he and Mr. Knight (for many years stuffer to the Norwich Museum) were perfectly satisfied with its identity (see 'Birds of Norfolk,' vol. ii., pp. 35, 36).—T. S.]

Stockdove (*Columba œnas*). I have not met with any recorded instance of this bird showing the same powers of simulation which are so well known in the plover and partridge. It may, therefore, be worth while to give an example which came under my own observation. In 1869, I found in Hampshire a nest with two eggs, on which the parent bird was sitting. The nest was in a hazel bush, and about 5 feet from the ground, so that I could not only see the bird well, but even attempted to catch it on the nest. It escaped, and to my surprise fell to the ground almost at my feet. Quite deceived by this unexpected ruse, I was going to pick it up supposing it to be injured, when it fluttered along the ground in apparently the most helpless way. After following it for some distance it rose and flew away vigorously.—John Lowe, M.D.

Vipers. J. Galley, gamekeeper, Northrepps, who is an excellent observer, tells me that when he lived at Cossey, and was employed as an underkeeper at Easton and Ringland, where vipers were very numerous, he went in the year 1850 to look for vipers on East Ringland Hills. The weather had been very dry for some weeks, but one afternoon a tempest came up and a good shower of rain fell. It was directly after this shower that he started in quest of vipers, and on arriving at the spot where he had previously often killed some, he saw several (some quite out from the surrounding bushes and others partly so) engaged in licking up the rain water from the fallen leaves which had been blown off the neighbouring oak trees. On another occasion he set a domestic hen on a clutch of pheasants' eggs in a furze bush, and on going to look at her, he found by the side of the bush a freshly killed viper, with its head picked to pieces. The hen was quietly seated on her nest, having,

he feels sure, previously destroyed the viper. He has once or twice found vipers in the woods here similarly killed with broken heads, inflicted, he thinks, by the pheasants.

His father, an old shepherd at Cossey, once found a large viper lying with her young ones near her, one of which ran down her throat on his approach, followed by a second, which, however, could only get partly down and then backed out again. Thereupon he killed the viper, and found in the anterior portion of the gullet the young one he had first seen creep down, and just below it a newly swallowed mouse, which blocked the passage, so that there was only room for one young one to take refuge between the mouse and the viper's mouth.—J. H. Gurney, 17th December, 1878.

License for Shooting, a.d., 1554. In the 'Visitation of Suffolke,' edited by Dr. J. J. Howard, and published in 1866, I observe at p. 17 the following passage, viz.:—"By letters patent dated August 31st, 1554, 1 and 2 Philip and Mary, license was granted 'unto our welbelovyd subjecte George Eden, to appoynte at his wyll and pleasure any one of his servauntes to shote in a crosbowe or handgone att all mannor of dere, heron, shullard, wildeswane, mallerd, teale, crane, bustard, and all other land fowle or water fowle whatsoever, and also to use, carrye, occupie, and kepe his said crosbowe or handgonne for the purpose aforesaide within the counties of Suffolk and Cambridge, and the lymyttes of the same.'"—(*Vide* Pat. Roll 1 and 2 Philip and Mary, Part V.)

George Eden was appointed in 1555 surveyor of Crown lands in Suffolk, and seems to have resided partly in London and partly at Sudbury, and to have had a landed estate at Wickhambroke, in Suffolk.—J. H. Gurney, June 15th, 1878.

Nest of Water-Spider (*Argyroneta aquatica*). In Wootton Marsh I find the nests of this spider in great quantity amongst the leaves of *Potamogeton pectinatus* and the algal stage of *Hypnum fluitans* with which the ditches are filled. A curious feature of design in these nests is, that they are all composed of fragments of *Chara flexilis*. At first sight it was a little puzzling to understand why this plant was selected for the purpose, but after thinking it over it became intelligible. This spider, as is well known, fills its nest, the opening of which is below, with air carried down with that object. As the water in the ditches is lowered during the dry

weather, the threadlike branches of the *potamogeton* and *hypnum*, by collapsing would squeeze out the air from the nest, were its walls not made sufficiently strong to resist the pressure; hence the selection of *chara*, which from the lime it contains is strong enough to afford resistance, and oddly enough is the only plant to be found there which would answer the purpose. From careful examination which I made, it was clear that in many instances the spiders would have to travel considerable distances to find the suitable material for building; but as a rule they were most numerous in the places where the *chara* flourished.—J. Lowe, M.D.

On the habits of the larva of the Tiger Beetle (*Cicindela campestris*). The larval form of this beautiful beetle exhibits the same rapacious habits as the adult, with this difference, that while the latter takes its prey by its greater activity and strength, the former, inhabiting as it does a burrow on the ground, has to resort to stratagem not less remarkable than that of the ant-lion.

Their habitat may be readily found on the commons or sandy places frequented by the adult beetles. A small opening in the ground surrounded by particles of sand thrown to a distance at once discloses the abode of this singular creature. Having kept some of them in confinement and observed their habits, a short sketch of these may be worth recording. The head is broad and flat, furnished with a very strong and sharp pair of mandibles, posterior to which is a slight depression covered with a glutinous secretion which is the bait by which flies are attracted, when the larva or rather the *trap* is set. The feet are turned backwards to render the ascent and descent of the creature more easy in its burrow.

In excavating the burrow which is generally perpendicular, the jaws are used to scoop out the soil which is carried on the top of the head to the surface of the ground, and then by a sharp jerk projected to a distance, sometimes of several inches.

In capturing its prey, the larva raises its head to the opening of its burrow, which it accurately fits, throws out a little of the glutinous secretion on the surface of the head, and awaits the approach of a fly or other insect. The moment the head is touched, an audible snap of the jaws shows that the victim is secured, and the larva at once descends into his lair to consume it.

They are by no means particular in the choice of food. I found

that mine would take large flies, spiders, earwigs, or beetles. Their sense of feeling was very acute, for on touching the head with a fine hair, they would make the same upward snap with their jaws, but after one or two fruitless attempts would refuse for a time to try any longer. After the prey was consumed, the uneatable parts were brought to the surface and cast to a distance.

On the 20th June they changed to the pupa state in which they were of a dirty white colour. On the 26th July they had become of a pearly appearance; a slight iridescence and a green tinge on the tarsi showed their approach to maturity. On the 2nd August they emerged in the perfect form, the elytra after exposure to light becoming first blue and finally green.—JOHN LOWE, M.D.

APPENDICULARIA FLABELLUM—LIGHT EMITTED ON BEING CRUSHED. One evening, after examining a specimen of *Appendicularia* under the microscope, I accidentally pressed the cover on the slide, after the light had been turned out. I was surprised to see a bright blue flash emitted. On repeating the operation with fresh specimens, a bright blue spark was given off in every instance from the rounded part of the body, which Professor Huxley says is occupied by the stomach and liver.

In Todd's 'Cyclopedia' it is stated that a similar bright blue light was seen by Smith to be emitted from the brain in a species of Cancer found in the Gulf of Genoa.

Some remarks in Mr. Herbert Spencer's 'Principles of Biology,' vol. i., p. 47, have a special bearing on this subject.—J. LOWE, M.D.

NOTE ON THE CALYX OF ROSE. A singular feature in the fringe of the calycine leaves of the rose was pointed out to me many years ago by the celebrated botanist Robert Brown, whom Humboldt styles "botanicorum facile princeps." Two of the leaves are fringed on each side, two have no fringe, and the fifth is fringed on one side only. This is due to their arrangement in æstivation, and will be found in all perfect roses. Mr. Brown quoted some Latin lines which he had found in an old monkish manuscript in the British Museum, showing that this peculiarity had not escaped notice. They are as follows:—

"Quinque sumus fratres uno sub tempore nati,
Duo barbati, duo sine barbâ creati
Quintus habet barbam, sed tantum dimidiatam"

JOHN LOWE, M.D.

VIII.

FAUNA AND FLORA OF NORFOLK.

Part IX. Hymenoptera.

Chrysididæ and Aculeata.

By J. B. Bridgman, V.P.

Read 25th March, 1879.

This List can hardly be called a County List, it being scarcely more than a record of those insects found in the neighbourhood of Norwich: the little spare time at my disposal preventing me from going far from home. I know of no collector of Hymenoptera in the county from whom I could obtain help, I am however indebted to friends for a few species which I have not been fortunate enough to capture myself.

My best thanks are due to the Rev. J. L. Brown, Messrs. C. G. Barrett, H. D. Geldart, T. G. Bayfield, and E. Atmore, but I am especially indebted to my very kind friend the late Mr. Frederick Smith of the British Museum, who examined a large number of my insects, and thus enabled me to supply a list as accurately named as possible, which is no mean advantage. I am also indebted to Mr. Edward Saunders who has been studying the Aculeates, and has brought several species to light which had formerly been mixed with other species, some of which appear in this list.

Several leading Entomologists during the present century have collected Hymenopterous insects in Norfolk. The Rev. W. Kirby, the author of 'Monographia Apum Angliæ,' published at Ipswich in 1802, mentions only four bees, which he had taken in Norwich or its vicinity; these are *Andrena labialis*, *A. collinsonana*, *A. albicrus*, and *A. convexiuscula*. Curtis also collected here, and in his 'British Entomology' several notices occur of insects taken in Norfolk. Stephens unfortunately did not finish his 'Illustrations,' and I am therefore unable to refer to him; in that part of the Hymenoptera which he did publish, mention is often made of Norfolk. Paget also notes many species as occurring at Yarmouth and ten miles round. Mr. Griffin, a Norwich

collector, is mentioned by Curtis and Stephens in connection with Norfolk Hymenoptera.

I have availed myself of these notices as far as I was able: many of Paget's captures were made in Suffolk, I have therefore only taken those which have the exact locality attached.

More recently Mr. F. Smith visited Mousehold and Cromer: the results of those visits are recorded in the 'Entomologist's Annual' for 1868—9, from these I have also made several quotations as well as from his 'Catalogue of British Fossores.'

The above are all the notices I have met with of our early workers. I believe none of the celebrated Entomologists I have just mentioned have left lists of Norfolk Hymenoptera or any part of the Order, although an excellent example was set them by Mr. Burrell, who wrote a very good list of Norfolk Coleoptera, published in the old Entomological Society's 'Transactions;' the date of the volume is 1812, and Mr. E. A. Fitch thinks it probably appeared at intervals, perhaps of two or three years, before that date. I am much indebted to Mr. Fitch for the trouble he has taken to find where this list appeared.

In Curtis's 'Entomology' two bees are recorded which, although I cannot fairly include them in my list, should, I think, be noticed: the first, *Andrena kirbii;* this insect is figured and described, to which description is appended the following note: "The rare insect figured was in the collection of the late Mr. W. Griffin, of Norwich, and was probably taken in the neighbourhood of that city; it now enriches the cabinet of Mr. Stephens." It is now in the collection at the British Museum, and was included in the first edition of the 'Catalogue of British Bees,' by Mr. Smith, but was deleted in the second edition, published in 1877, in the introduction to which the following remark appears: "Ten species are entirely new additions to this part of the British Fauna, whilst two, formerly believed to be British, have been omitted, *Sphecodes fuscipennis* and *Andrena kirbii.*"

The other species is *Heriades truncorum*, a very rare insect, of which Curtis says: "Taken at Brentford; I believe that my female came from Norfolk." Concerning both insects some doubt exists, and it is very doubtful whether the first named is a British species.

The list of ants is not so complete as I could wish. I have hitherto been unable to meet with even a single specimen of any of

the larger red ants, although I have no doubt some of them are to be found in the county. That one species did exist in this county, I have positive proof, for in an old diary of the late Mr. R. Wigham, of this city, is the following entry, dated August 13th, 1823: "*Formica herculanea*, Felthorpe," but which of our species is meant, it is now impossible to say; it certainly was not the one named, as that is not a British species, although placed in this list.

The nomenclature I have used for the *Chrysididæ* is that adopted in the Entomological Society's list, compiled by the Rev. T. A. Marshall. For the *Fossores* I have taken that of the above-mentioned Society's list, compiled by Mr. F. Smith, and in some few instances that of Thomson, in tom. iii., 'Hymenoptera Scandinaviæ;' and for the Bees that adopted by Mr. Smith in the second edition of the 'Museum Catalogue of British Hymenoptera.' Part I. Bees.

In conclusion, I can only add, that I believe this list might be much enlarged if other parts of the county were properly worked; this I hope will yet be done by some other entomologist.

CHRYSIDIDÆ.

Cleptides.

Cleptes semiauratus. Lin. Norwich, common in July, running about the leaves of plants. Yarmouth, Paget.

" nitidulus. Fab. This rare species is noticed in Curtis's 'Entomology' as "Taken by Mr. Paget on sand hills at Yarmouth in June." In the above work there is a good description of the male, which is wanting in Mr. Smith's monograph of this family, in the 'Entomologist's Annual,' for 1862. I have found the species in tolerable abundance running amongst the short grass on the sands between the rifle butts and the Aquarium at Yarmouth, in August.

Ellampides.

Ellampus panzeri. Fab. Eaton and Mousehold, three specimens in the middle of August, 1875, from flowers.

Homalus auratus. Lin. } Common from the end of May,
" cœruleus. Geer. } and during the summer.

HEDYCHRIDES.

HEDYCHRUM LUCIDULUM. Fab. Eaton and Mousehold during July. I find this local species in plenty at the latter locality flying about the burrows of a mixed colony of *Cerceris arenaria*, *C. labiata*, and *C. ornata*, on which no doubt it is parasitic.

,, ARDENS. Curt. This species was first discovered by Curtis in the county. I have taken it very sparingly at Eaton in June.

,, ROSEUM. Rossi. Two specimens only, flying about a bank on Mousehold in August.

CHRYSIDIDES.

CHRYSIS IGNITA. Lin. Abounds from the end of May in the neighbourhood of old posts, rails, and walls.

,, VIRIDULA. Lin. Harford bridges in June.

,, CYANEA. LIN. Like *ignita* this species abounds everywhere.

,, AUSTRIACA. Fab. I have only taken two specimens in a lane at Eaton, in June, and one at Brundall.

ACULEATA.

HETEROGYNA.

FORMICIDÆ.

FORMICA FUSCA. Lin. Abundant.

,, FULIGINOSA. Latr. Common in the neighbourhood of rotten trees.

,, NIGRA. Lin. Everywhere.

,, FLAVA. Geer. Very common.

CAMPONOTUS HERCULANEA. Lin. This species was taken alive (females and neuters, from timber from New Brunswick) in the saw-yard of Mr. Saul, St. Martin-at-Palace, Norwich, April, 1877. See 'Transactions of the Norfolk and Norwich Naturalists' Society,' vol. ii., p. 275.

Myrmicidæ.

Myrmica ruginodis. Nyland. Norwich; not so common as the next two species.

„ scabrinodis. Nyland. Very common.

„ lævinodis. Nyland. By far the commonest of the three species; in this neighbourhood.

Diplorhoptrum domesticum. Shuck. This little pest, the red house-ant, is to be found in some of the houses on the Gentleman's Walk, Norwich.

Mutillidæ.

Mutilla ephippium. Fab. Not uncommon on dry sunny banks round the city, in August.

Myrmosa melanocephala. Fab. Norfolk, June: Samouelle's 'Entomologist's useful Compendium,' 1824. As the last species, but I have not taken it before the end of July.

FOSSORES.

Scoliidæ.

Tiphia femorata. Fab. Cromer, August, 1868, Mr. F. Smith. Not uncommon on the Umbelliferæ, end of July and August, in the neighbourhood of Norwich.

„ minuta. Lind. A few females, end of June and beginning of July, at Eaton and Mousehold.

Sapygidæ.

Sapyga 5-punctata. Fab. I have only taken this common insect in Norfolk at Brundall, in July.

Pompilidæ.

Pompilus fuscus. Lin. Everywhere; females appear in early spring, and again with the males in the autumn.

„ trivialis. Dahlb. *gibbus.* Smith. } On every dry bank.

„ consobrinus. Dahlb. *gibbus.* Smith. } Neighbourhood of Norwich. 'Entomologist's Mon. Mag.,' vol. xv., p. 199.

POMPILUS PECTINIPES. Lin. Mousehold.

„ PLUMBEUS. Fab.? Yarmouth, Cromer; and by Mr. F. Smith; Bawsey Heath, Mr. E. Atmore; August and September.

„ NIGER. Fab. This insect is included in my list on the authority of Paget's list. I have not taken it.

„ RUFIPES. Lin. Yarmouth, Paget; Earlham and Yarmouth in August.

PRIOCNEMIS SEPICOLA. Smith. Not uncommon in the spring in hedgerows.

„ AFFINIS. Lind. In Mr. Smith's 'Catalogue of British Fossores,' p. 65, amongst the localities for this species he gives "Norfolk," and time of appearance August and September.

„ EXALTATUS. Fab. Everywhere during July and August.

„ HYALINATUS. Fab. I have taken the male of this local species in my garden in Norwich, and females on Mousehold, in July, August, and September.

AGENIA BIFASCIATA. Fab. Two females and one male on the trunks of trees at Eaton and Earlham, in June and July, 1878.

CEROPALES MACULATA. Fab. Not uncommon round Norwich on Umbelliferæ in August. Curtis says "Middle of August, Norfolk."

SPHEGIDÆ.

AMMOPHILA SABULOSA. Lin. Appears in May and is very abundant.

„ VIATICA. Lin. Not so abundant as the last, and appears later in the year.

„ LUTARIA. Fab. Much rarer than the other two; Mousehold, in July.

MISCUS CAMPESTRIS. Latr. This species I have only taken on Mousehold early in July.

LARRIDÆ.

TACHYTES POMPILIFORMIS. Panz. Far from rare in June and July, Norwich; Cromer, Mr. F. Smith.

ASTATA BOOPS. Schr. Mousehold, not common; from about the middle of July and August.

NYSSONIDÆ.

NYSSON SPINOSUS. Fab. Not uncommon, Lakenham and Brundall, end of May to middle of July.

„ TRIMACULATUS. Rossi. I have taken this species in our garden in Norwich in July, at Brundall and Heigham in August.

„ DIMIDIATUS. Jurine. This species is not uncommon in the neighbourhood of Norwich—Earlham, Eaton, Brundall; middle of July and August.

GORYTES MYSTACEUS. Lin. Tolerably common in May and June; Norwich, Brundall.

„ QUADRIFASCIATUS. Fab. Horning marshes: Curtis's 'Entomology.' Brundall and Heigham, end of June and July.

HARPACTUS TUMIDUS. Panz. Earlham, Eaton, July and August. Sand hill, Yarmouth, in June: Paget.

MELLINUS ARVENSIS. Lin. Very common. Eaton, Earlham, Mousehold, and Brundall, August and September; Yarmouth, Paget; Bawsey Heath, Mr. E. Atmore.

„ SABULOSUS. Fab. Brundall in July. Mr. Smith in his 'Museum Catalogue of British Fossores,' p. 115, says, "It has been taken in Norfolk."

CRABRONIDÆ.

TRYPOXYLON FIGULUS. Lin. Very common during the summer.

„ ATTENUATUM. Smith. Equally plentiful with the last.

„ CLAVICERUM. St. Farg. This species appears to be much scarcer than the two former.

CRABRO CLAVIPES. Lin. Norwich, Harford Bridges, Earlham, June to September; "Norfolk, in June," Curtis's 'Entomology.'

„ TIBIALE. Fab. I have recently taken this species at Brundall.

„ SIGNATUS. Panz. I smoked a male out of some old railings at Eaton, in the middle of June, 1874. I believe only two other males, and no females have been taken in this country.

„ LUTEIPALPIS. St. Farg. Lynn, Norwich, and Brundall, June and July.

CRABRO VARIUS. St. Farg. Brundall, Earlham, July and September.

,, LEUCOSTOMA. Lin. Norwich, common, from the end of May.

,, EXIGUUS. Shuck. I have only taken a single specimen of this small *Crabro* at Earlham, middle of July, 1874.

,, WALKERI. Shuck. Cromer, August, 1868, Mr. F. Smith: 'Entomologist's Annual,' 1869.

,, WESMAELI. Lind. One specimen at Cromer, the beginning of August, 1877. Mr. Smith has taken it at Lowestoft.

,, OBLIQUUS. Shuck. Cromer, August, 1868, Mr. F. Smith; Norwich, Brundall, middle of August.

,, 4-MACULATUS. Fab. Perhaps the most abundant species of the genus during July and August.

,, SCUTATUS. Fab. Not uncommon in the neighbourhood of Norwich, July and August.

,, CEPHALOTES. Panz. Horning, Curtis's 'Entomology;' Cromer, Mr. F. Smith, 'Entomologist's Annual' for 1869; Brundall, middle of August. Amongst several males of this species, I took the variety at one time thought to be a separate species, and named *sexcinctus*.

,, CRIBRARIUS. Lin. Very common during the summer everywhere.

,, PATELLATUS. Panz. Equally common with the last.

,, PALMIPES. Lin. Mousehold and Earlham. The males are not rare; of the female, Mr. Smith says in his 'British Fossores,' "The latter sex [female] has not been taken in this country."*

,, VAGUS. Lin. }
,, CHRYSOSTOMUS. St. Farg. } Brundall, June and August.

,, ALBILABRIS. Fab. Cromer, August, 1868, Mr. Smith, 'Entomologist's Annual,' 1869; Norwich, very common during the summer.

* I not quite certain that the females of this species and *varius* are; I have females of *varius* which differ from each

Crabro panzeri. Lind. Cromer, August, 1868. Taken by Mr. F. Smith, 'Entomologist's Annual,' 1869.

„ brevis. Lind. Cromer, August, 1868, Mr. Smith; Norwich, very common in August.

Oxybelus uniglumis. Lin. June, July, and August, abundant on every dry bank.

„ mandibularis. Dahl.
„ „ Thoms.
} This species was identified by Mr. E. Saunders. I have taken one male in this neighbourhood. See 'Entomologist's Mon. Mag.,' Vol. XV., p. 199.

Spilomena troglodytes. Shuck. I have taken but one specimen of this minute insect; it was flying about some palings in Park Lane, Norwich, August 18th, 1875.

Stigmus pendulus. Panz. Abundant on leaves and about some old palings in my garden in Norwich, June and July.

Diodontus minutus. Fab. Everywhere during the summer.

„ luperus. Shuck. Equally common with the above.

„ tristis. Lind. I have found this much less frequently than the other two species.

Passalœcus cornigera. Shuck.
insignis. Shuck ♂.
} Generally distributed during the summer.

„ brevicornis. Thoms.
insignis. Shuck ♀.
cornigera. Shuck ♂.
} Not uncommon.

„ turionum. Dahlb. Neighbourhood of Norwich. This species is very likely confused with the two preceding species in this country.

„ gracilis. Curt. I have taken but one specimen of this species. I am indebted to Mr. E. Saunders for the discrimination of the species of this genus.

Pemphredon lugubris. Fab. Tolerably abundant in summer.

Cemonus unicolor. Lind.
„ lethifer. Shuck.
Psen pallipes. Panz.
} Very abundant during June, July, and August.

MIMESA EQUESTRIS. Shuck.
„ *shuckardi*. Wesm. } Far from common, Mousehold and Brundall, in August. 'Entomologist's Mon. Mag.' Vol. xv., p. 199.

„ BICOLOR. Jurine. Generally distributed in suitable places, during July and August.

PHILANTHIDÆ.

CERCERIS ARENARIA. Lin. Yarmouth and Mousehold, July and August.

„ LABIATA. Fab. Common round Norwich, July and August. Bawsey Heath, Mr. E. Atmore.

„ ORNATA. Fab. Equally common with the previous species.

DIPLOPTERA.

EUMENIDÆ.

ODYNERUS SINUATUS. Fab. Heigham and Brundall in July.

„ GRACILIS. Brullé. The Rev. J. L. Brown gave me this insect, which he had taken at Postwick in 1876.

„ SPINIPES. Lin. Harford Bridges and Brundall, July.

„ MELANOCEPHALUS. Gmel. I took a single female at Brundall in July, 1873; this differs from any described variety I have seen, in having a pale line below the metathorax.

„ PARIETINUM. Lin.
parietum var. Smith. } Not uncommon in some seasons. There is a very good figure of this distinct fine species in Curtis's 'British Entomology,' iii., 137 ♀.

„ PARIETUM. Lin. Very abundant.

TUS. Panz.
„ Thoms. } Equally abundant as the last.

E. AT Oliv. Not uncommon.

Curt.
Thoms. } Occasionally taken in the neighbourhood of Norwich.

Panz. Lynn, Mr. E. Atmore.

VESPIDÆ.

VESPA CRABRO. Lin. Generally distributed.

„ VULGARIS. Lin. } Common.
„ GERMANICA. Fab. }

„ RUFA. Lin. Not uncommon.

„ SYLVESTRIS. Scop. Not rare. In 1875 I took a nest of this species out of a bank, and obtained all the sexes; it is not its general habit to build underground.

„ NORVEGICA. Fab. The Rev. J. L. Brown gave me a nest which he took at Witton, July 26th, 1875; it contained the three sexes. This is the only time I have met with it in Norfolk.

ANTHOPHILA.

ANDRENIDÆ.

COLLETES SUCCINCTA. Linn. Abundant on Mousehold at the flowers of the heath, August and September; Bawsey Heath, Mr. E. Atmore; St. Faith's.

„ FODIENS. Kirby. Norwich, Yarmouth, Bawsey Heath, E. Atmore; July, August, and September, at Ragwort.

„ DAVIESANA. Smith. In almost every sandy bank during the summer.

PROSOPIS COMMUNIS. Nyl. The commonest species of the genus; during June, July, and August.

„ CONFUSUS. *punctulatissimus.* Smith ♂. } Not common; at the flowers of the bramble, Earlham, Brundall; see 'Entomologist.'

„ SIGNATA. Panz. Generally to be found at the flowers of the mignonette.

„ HYALINATA. Kirby. Rather common.

„ PERFORATOR. Smith. Occasionally taken at the flowers of the bramble, Earlham.

„ VARIPES. Smith. I have taken but one male in the neighbourhood of Norwich.

SPHECODES GIBBUS. Lin. } Generally distributed, common.
„ RUFIVENTRIS. Wesm. }

„ SUBQUADRATUS. Smith. Brundall, Eaton. I have taken but few specimens of this species.

„ EPHIPPIUS. Lin. Very common.

ANDRENA HATTORFIANA. Fab. I took this very handsome insect in July, 1876, at Eaton and Worstead at the flowers of *Knautia arvensis*, which seems to be the only plant it frequents.

„ DECORATA. Smith. Plentiful round Norwich, Brundall, and Costessey, end of July and August. I have only found it at the flowers of the bramble.

„ CETII. Schrank. Eaton is the only locality I know of for this lovely little species; there I have taken it pretty freely at the flowers of *Knautia arvensis* in August.

„ CINGULATA. Fab. Not uncommon from the middle of May and June at the flowers of Germander Speedwell, in the neighbourhood of Norwich.

„ PILIPES. Fab. Occasionally taken round Norwich, end of May and June.

„ THORACICA. Fab. Generally distributed round Norwich, Brundall, Wroxham, middle of April and May; it appears again towards the end of July if the weather is hot. I have taken it several times in the latter month.

„ NITIDA. Fourc. This generally distributed species seems far from common round Norwich. I have only taken two females and a few males; Brundall, Lynn, Mr. E. Atmore. End of April, May, and June.

„ VITREA. Smith. Far from common; on Mousehold and Brundall, at the flowers of the bramble in July.

„ ALBICANS. Kirby. Very common everywhere. Mr. Smith says, "Although so numerous, I have never met with colonies." There is a large colony at Brundall, principally in a heap of earth (about a cart-load), in the corner of a meadow; they have also burrowed into the meadow itself amongst the grass.

ANDRENA CLARKELLA. Kirby. This species is included on the authority of Paget, who gives it in his list of insects found at Yarmouth.

" GWYNANA. Kirby. Very abundant in early spring; found principally at the flowers of the dandelion.

" BICOLOR. Fab. Not uncommon, Norwich, Brundall; June and July.

" HELVOLA. Lin. Common in the neighbourhood of the city, April, May, and June.

" VARIANS. Rossi. Much less common than the preceding, and is to be found during the same months.

" ATRICEPS. Kirby. One of the earliest of the spring bees, and very abundant at willows, and early spring flowers.

" NIGRO-AENEA. Kirby. Perhaps the most common and generally distributed species of the genus; it does not appear quite so early as the preceding.

" TRIMMERANA. Kirby. This species is fairly common round Norwich during April, May, and June.

" PICICORNIS. Kirby. This very local species is far from common. I have only taken three females and two males at Mousehold and Cringleford, in April.

" BIMACULATA. Kirby. Mr. Smith says, "I took the female some years ago, but have never found the male." Beside the specimens taken by Kirby, these I believe are the only ones that have been taken; although very local, they abound in some seasons all round Norwich, and also at Brundall. Some doubt has been expressed as to this being a distinct species, or being anything more than a variety of *decorata*, or rather, the latter a variety of *bimaculata*, though certainly very much alike when compared singly; but when a series of each are compared, I think there can be no doubt but that they are two good species, to say nothing of the difference of the time of appearance of the two insects. This appears early in April, whereas *decorata* does not appear till the end of

July. The legs of *decorata* are mu
especially the pubescence of the scopa,
basal joint of the hinder tarsi; the face
of the abdomen as a rule are much paler
bimaculata. I think all these differen
bined clearly point to two distinct specie

ANDRENA SMITHELLA. Kirby. One of the very earlies
spring bees. I have taken it in plent
flowers of the willow, round Norw
Brundall.

" NIGRICEPS. Kirby. The female is plentiful
neighbourhood of the city in July and
generally to be found at the flowers
ragwort. I have taken but one male.

" PUBESCENS. Kirby. Mousehold, at the flowe
heath, in August.

" TRIDENTATA. Kirby. Mousehold and Eaton;
the males are not uncommon at the ra
July, I have taken but two of the femal

" ANGUSTIOR. Kirby. Very scarce. I have c
with a single female on the Heart's-e
Mousehold, on May 25th, 1875.

" FUCATA. Smith. The Rev. J. L. Brown ga
female which he took at Carbrooke, J
1875. I have not taken it myself.

" APRILINA. Smith. Mr. Smith returned my
with the following remarks: "I have c
your bee with my collection, and find it
as a species taken near Shoreham by the
Walcott, of Bristol, and which I belie
A. aprilina. Mr. Walcott sent me bot
the male sent is certainly *A. aprilina*.
know on what authority he united the s
for this reason I have added a ? to the
My specimen was taken in April, 1873.

" FULVICRUS. Kirby. The Rev. J. L. Brown g
male he took at Brundall in 1874.

" ALBICRUS. Kirby. Generally distributed and
in April and May.

ANDRENA LABIALIS. Kirby. Not common, Eaton, Harford Bridges, and Brundall; Yarmouth, Mr. C. G. Barrett; Lynn, Mr. E. Atmore; it appears in June.

" CHRYSOSCELES. Kirby. The Rev. J. L. Brown took two females of this at Carbrooke, in June 1875; and Eaton, 1878.

" COITANA. Kirby. Not uncommon round the city; plentiful at Brundall in July and August.

" PARVULA. Kirby. Very common, generally appearing with the first fine days at the end of March.

" MINUTULA. Kirby. Far from common; in the neighbourhood of Norwich, July and August; Bawsey Heath, August, Mr. E. Atmore.

" NANA. Kirby. Not uncommon; Eaton, Earlham, and Mousehold, end of May and June.

" DORSATA. Kirby. Common at the flowers of the bramble in July and August.

" COMBINATA. Kirby. Taken sometimes freely at willow blossoms in April, at Norwich and Brundall. The colour of the legs can hardly be relied upon as distinguishing this species from the one before-named, although the colouring is fairly constant; however, this last year (1877) I took a male of *dorsata* which wants the pale spot at the apex of the hinder tibiæ, but the puncturing of the thorax seems more constant, that of *dorsata* being deeper and a trifle larger than that of *combinata*; both species vary much in the depth of the colouring of the legs.

" CONNECTENS. Kirby.? Norwich. It is very doubtful if this is a good species.

" FUSCATA. Kirby. The female only of this species is known. Mr. Smith is inclined to believe it is only a black-legged variety of the next, in which I quite agree with him. Mousehold, April and May.

" AFZELIELLA. Kirby. Common in April and May; and again at the end of July.

ANDRENA CONVEXIUSCULA. Kirby. Very plentiful in the neighbourhood of Norwich, middle of April, May, and June.

„ COLLINSONANA. Kirby. I have included this species on the authority of Kirby. In his 'Monographia Apum Angliæ' he gives: "Hab. In Angliâ, prope Norvicum capta Junis mense, 1799." And as he named the species, it has a right to a place in this list.

„ XANTHURA. Kirby. Generally distributed. April and May.

CILISSA HÆMORRHOIDALIS. Fab. Not uncommon at the flowers of the various species of *Campanula*; middle of July and August.

„ LEPORINA. Panz. Occasionally taken in the middle of July and August at Eaton and Brundall at the flowers of the white clover.

HALICTUS RUBICUNDUS. Kirby. Not uncommon.

„ LEUCOZONIUS. Schr. Very common.

„ QUADRINOTATUS. Kirby. Tolerably abundant.

„ CYLINDRICUS. Fab. Common.

„ MALACHURUS. Kirby. Taken by Mr. F. Smith at Cromer, August, 1868; 'Entomologist's Annual,' 1869.

„ ALBIPES. Fab. Very common.

„ FULVICORNIS. Kirby. Cromer, Mr. F. Smith, 'Entomologist's Annual' for 1869.

„ VILLOSULUS. Kirby. Cromer, Mr. F. Smith, *l.c.*; not uncommon round Norwich.

„ TUMULORUM. Lin. Very abundant.

„ SMEATHMANELLUS. Kirby. Occasionally taken near the city; Brundall, Cromer, Mr. F. Smith, *l.c.*

„ ÆRATUS. Kirby. } Very common.
„ MORIO. Kirby. }

„ LEUCOPUS. Kirby. I have taken but two females in this neighbourhood, the males are not quite so scarce, but still they are rarely taken.

„ MINUTUS. Kirby. } Generally distributed.
„ NITIDUSCULUS. Kirby. }

HALICTUS LONGICEPS. Saunders. Neighbourhood of Norwich. This species is described in the 'Entomologist's Mon. Mag.,' Vol. xv., p. 200, by Mr. E. Saunders.

„ MINUTISSIMUS. Kirby. Very common.

DASYPODA HIRTIPES. Latr. Marram hills, on the Caistor side of Yarmouth, is the only locality that I know of in the county for this handsome insect; August.

MACROPIS LABIATA. Panz. Brundall, where it was first taken by Rev. J. L. Brown in July, 1874. I have since taken the male at the same place, frequenting flowers of the creeping thistle, wild peppermint, marsh potentilla, and *Lysimachia vulgaris*. I also succeeded in taking in August this year the female, which had not been previously detected in this country; they were collecting pollen from the flowers of the *Lysimachia* only.

APIDÆ LEACH.

Sub-Fam. I. ANDRENOIDES. Latr.

PANURGUS BANKSIANUS. Kirby. Very abundant on Mousehold and at Eaton, end of June, July, and August.

Sub-Fam. II. CUCULINÆ. Latr.

NOMADA RUFICORNIS. Lin. Very common, end of April, May, and June.

„ LATERALIS. Panz.
xanthosticta. Kirby.
bridgmaniana. Smith.
} I first detected this pretty species at Brundall, and afterwards found it at Cringleford. It appears the middle of April and May. I am indebted to Mr. E. Saunders for the correction of the nomenclature of this species.

„ OCHROSTOMA. Kirby. This is one of the rarest Nomada I have taken in this neighbourhood; one female at Earlham, and another at Eaton, in June, are all I have yet met with.

NOMADA ARMATA. Schäff. I took three females of this fine species at Eaton, July 13th, 1876, and another at the same spot in 1878.

„ OBTUSIFRONS. Nyl.
mistura. Smith.
xanthosticta. Smith *(partim).*
} Not uncommon at Brundall, the end of July and August, at the flowers of the creeping thistle. I believe it is parasitic on *Andrena coitana*, as that is the most abundant likely species which is to be found at the same time and place.

„ FLAVO-GUTTATA. Kirby. Lynn; Mr. E. Atmore, end of May.

„ FURVA. Panz. Not uncommon; flying about the burrows of the small *Halicti* at the end of May and June.

„ SOLIDAGINIS. Panz. Extremely plentiful at the ragwort in July and August.

„ JACOBÆÆ. Panz. Rather plentiful in July and August, 1874, otherwise far from common.

„ LINEOLA. Panz. Back of Mousehold, end of May and June, is the only place I have met with this insect.

„ SEXFASCIATA. Panz. There is a large colony of *Eucera longicornis* by the road side, about a mile from the Thorpe Asylum, on the left-hand side, and about which this bee may be found at the end of May and June.

„ ALTERNATA. Kirby.
„ SUCCINCTA. Panz.
} Very common end of April, May, and June.

EPEOLUS VARIEGATUS. Lin. Very common about the burrows of *Colletes daviesana*, and at ragwort, July and August; Bawsey Heath, September, Mr. E. Atmore.

MELECTA ARMATA. Panz. Very common about the burrows of *Anthophora acervorum*, end of March, April, and May.

STELIS ATERRIMA. Panz. I generally take one or two specimens of this bee in my garden in Norwich, at the flowers of a *Coreopsis* at the beginning of July. I have taken it nowhere else.

COELIOXYS QUADRIDENTATA. Lin. Not uncommon in June. Eaton, Postwick; Yarmouth, Mr. C. G. Barrett; Bawsey Heath, Mr. E. Atmore, September 10th, 1877.

„ SIMPLEX. Nyl. Very abundant in June and July.

„ ACUMINATA. Nyl. I detected this species mixed with *simplex*, which it greatly resembles; both sexes were met with. I believe it is not uncommon.

„ RUFESCENS. St. Farg. Much less common than the first two, and appears about the same time that they do; Eaton, Mousehold, and Brundall.

Sub-Family III. DASYGASTRÆ.

OSMIA RUFA, Lin. Very abundant in early spring at garden flowers, and the blossoms of fruit trees.

„ ÆNEA. Lin. Not uncommon, end of April, May, and June; the female I have generally found at the red nettle.

„ FULVIVENTRIS. Panz. Taken freely in the neighbourhood of old posts or railings, in June and July; Norwich, Eaton, Harford Bridges, and Brundall.

„ SPINULOSA. Kirby. Apparently scarce. I have taken but two females from the flowers of the ragwort at Brundall, in July and August.

CHELOSTOMA FLORISOMNE. Lin. I have only met with this species at Harford Bridges, it appears in June and July.

„ CAMPANULARUM. Kirby. This abounds in gardens in Norwich; it frequents only, as far as I have observed, various species of *Campanula*.

ANTHIDIUM MANICATUM. Lin. Abounds at Midsummer.

MEGACHILE CENTUNCULARIS. Lin. Very common in gardens and at the flowers of the bramble during June, July, and August.

MEGACHILE LIGNISECA. Kirby. This species I have not met with, but have included it in my list on the authority of Paget, who says, "common in gardens." I have some doubt as to the correctness of the name of Paget's species, because he makes no mention of *M. maritima*, an equally large species which does abound there. It is just possible that he may be right, and his species be the true *M. ligniseca*. He was in communication with Curtis, who may have named his insects. He makes no mention of *Dasypoda hirtipes* which is also "common in gardens," so my doubts may be unfounded.

" VERSICOLOR. Smith. I have a female which Mr. Smith returned to me as this species; I took it in my garden in 1873.

" CIRCUMCINCTA. Kirby. Not uncommon round the city, during the months of June and July.

" WILLUGHBIELLA. Kirby. By far the most plentiful species of the genus in this district, during June, July, and August.

" MARITIMA. Kirby. Not uncommon on Mousehold and Yarmouth; July and August.

Sub-Fam. IV. SCOPULIPIDES. Latr.

EUCERA LONGICORNIS. Lin. Not uncommon round Norwich. There is also a large colony extending about a quarter of a mile by the road side at Postwick; they make their appearance about the end of May.

ANTHOPHORA RETUSA. Lin. Plentiful on Mousehold and the neighbourhood. The general time of appearance is the beginning of May, but in 1874 I took a male as early as April 7th, and they were to be seen in plenty on the 19th of the same month.

" ACERVORUM. Fab. To be found in almost every dry bank. This is perhaps the earliest spring bee: it appears with the first fine days at the end of March.

ANTHOPHORA FURCATA. Panz. Not uncommon at Eaton, Earlham, Mousehold, and Brundall; it frequents the flowers of the red nettle. I have taken the male as early as May 17th, but the usual time of appearance is the middle of June, and they may be found until the end of August. I have several times found the nests of this species in old posts. This differs slightly in its economy from the two preceding species; though all make cells in which to lay their eggs, the former making them of clay in banks or the ground, and the latter of triturated wood; it also spins a brown cocoon previous to assuming the pupa condition, and which the former two do not, but it does not make the cocoon till just before it changes. When I have taken the larva in the middle of winter there was no cocoon. One, and the only one I raised or attempted to raise, passed through the pupa stage without making a cocoon. I made a cell of blotting paper formed round a pencil, secured the sides with a piece of cotton, and closed the mouth with a pellet of the same paper, and in this cell it passed to a perfect bee, as I have said before, without making a cell.

BOMBUS MUSCORUM. Lin. Very abundant.

,, AGRORUM. Fab. Neighbourhood of Norwich.

,, VENUSTUS. Smith. Not uncommon.

,, ELEGANS. Seidl. Far from common; Mousehold, Yarmouth, Brundall, Cromer, Mr. Smith, 'Entomologist's Annual,' 1869. I met with a nest of this species underground at Brundall, in 1876.

,, SYLVARUM. Lin. Very common.

,, DERHAMELLUS. Kirby. Not uncommon.

,, PRATORUM. Lin. Very abundant.

,, JONELLUS. Kirby. Apparently scarce in this district. I have never taken it, but have two neuters which Mr. C. G. Barrett gave me; these he took in the neighbourhood of Norwich in 1873.

BOMBUS LAPIDARIUS. Lin.
" LUCORUM. Lin. } To be found everywhere.
" VIRGINALIS. Kirby.
" HORTORUM. Lin.
" LATREILLELUS. Kirby. Not uncommon, though by f the rarest of these large *Bombi* in this neighbou hood.
" SUBTERRANEUS. Lin. Tolerably abundant.
APATHUS RUPESTRIS. Fab.
" VESTIALIS. Fourc. } Very abundant.
" BARBUTELLUS. Kirby.
" CAMPESTRIS. Panz. Although the males are sufficientl plentiful with the other species at the flowers the thistles in autumn, the females seem far fro common. I have only taken three of them.
APIS MELLIFICA. Lin.

FLETCHER AND SON, PRINTERS, NORWICH.